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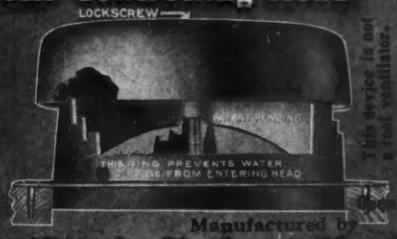

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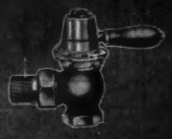

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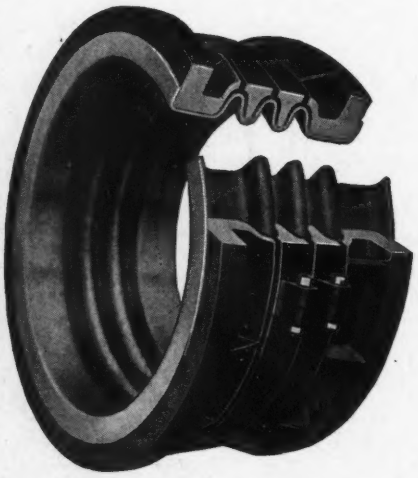

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THE HEATING AND VENTILATING MAGAZINE

1123 BROADWAY NEW YORK AUGUST, 1916

Central Station Heating the Method of the Future

BY ARTHUR WILLIAMS.

Commercial Manager of the New York Edison Company.

(From an address before the National District Heating Association.)

We have become so used, in America, to artificial heat, supplied to us in a clean, efficient and satisfactory manner, that we do not appreciate what a modern convenience and necessity such heat, with steam as its source, has grown to be and what an essential part it has become in our daily lives.

It has always seemed to me, and I want to remark upon it in this connection, that I should rank heat as a human necessity in advance even of light, today. I make that confession because, although my entire life has been identified with the placement of electric light in the service of the local public here, yet, if the choice were left to me as to which of these two great conveniences should be eliminated, if one had to be, I should say that light would have to give way to heat; that we would even have to go back to obsolete methods of lighting, rather than to obsolete methods of obtaining heat, or of having no heat at all.

CENTRAL HEATING STATIONS FOR NEW YORK.

My second thought is that the ideal method of supplying heat in a city such as New York is that of the central station, and I am of the opinion that the day is not far distant when the small heating plant will become obsolete and we shall obtain heat exactly as we now obtain light and power, to a large extent, from a central station. My opinion is based partly upon the element of convenience, in that it is humanly possible today to turn a valve and heat a building; and humanly possible to eliminate the building of a fire and the delay that comes between the lighting of the fire and the actual obtaining of the heat in a radiator. This readiness with which heat can be instantly had when desired, together with the elements of cleanliness and sanitation resulting therefrom, constitute factors of such predominance in our modern life that I think, even if the cost of such a convenience were greater, the method has so much in its favor that in the long run it is bound to survive.

CONSUMPTION OF FUEL A FACTOR.

I am personally of the opinion that heating will be supplied from central stations eventually, because of the seemingly evident economy in the consumption of fuel. And in the supplying of heat for such buildings as we find in New York and Chicago I cannot believe that we shall ever see the substitution of water-falls for the coal pile. As time goes by, anything that tends to

economy in the consumption of fuel for the attainment of a given object is bound to prevail in comparison with less efficient methods.

LABOR WILL BE CONSERVED.

Then again, there is the element of labor; and about that I want to say a word later on. If, in the long run, labor can be conserved through the securing of a given result with less labor, and especially if that result can be secured with less onerous labor, I am of the opinion that that method is going to prevail which is based largely on these two considerations, because the trend of the present century is toward results and toward means which seek to conserve human strength and human health. And the inventive effort and energies of this age are being more and more directed along those avenues of achievement that will provide means of conserving the health and strength, not of the average of all the population, but of each individual unit, man, woman or child.

I am further of the opinion that the central station method of heating will prevail, because I personally have been greatly impressed by observing central station units in other places, as well as in New York City. I have in mind such cities as Lockport, Indianapolis and others, and the plants of the New York Steam Company, in our own city.

DIFFICULTIES LIKE THOSE IN EARLY DAYS OF ELECTRICAL INDUSTRY.

I am aware that there have been difficulties at the outset of this industry, almost paralleling those that occurred in the electrical industry and which it took time to overcome. But it seems to me that the solution of these problems, which have also arisen in the heating industry, is within the grasp of the human mind; that such questions, for instance, as the efficient transmission of heat and steam from central stations to the buildings to be supplied will be satisfactorily settled, no matter how difficult their solution may appear at first; and that efficient and economical systems will be available in the near future, if they are not entirely so today.

THE ELECTRICAL AND STEAM ENGINEER SHOULD STAND SHOULDER TO SHOULDER.

If you will bear with me for a moment, I should like to approach the matter somewhat from the standpoint of the engineer who insists that the maintenance of steam service in a building is first a measure of necessity, and, secondly, that the presence of that steam service in a building justifies the coincident presence of an electric light plant. In seeking their common objectives, I hold that the electrical engineer and the steam engineer should stand shoulder to shoulder in a united effort to solve their mutual problems—that is, the rendering of a high-class, economical and relatively cheap public service. My experience, extending over a great many years, has been that the engineer of a large building uses the necessity for heat pretext for the installation of an electrical plant. The one being necessary, then he reasons that the other can be more cheaply maintained. In the process of reasoning or of accounting, he will assign, as a practical matter, an abnormally or relatively high cost to heating, leaving the difference between the alleged heating cost and the total cost of operation as that part of the total which should be charged to the electrical plant.

The next step is to take the entire electrical installation and greatly overestimate the average use, thereby reaching an entirely fictitious result as to the number of kilowatt hours required. Having reached that point in the process, the rest becomes comparatively easy, because the fictitious balance of the plant operation divided by the fictitiously high demand for electric current, gives a very low kilowatt hour resultant. Then multiplying the fictitiously high kilowatt hour consumption by the rate of the electrical company brings the electric light bill to a point where it is very much to the building engineer's satisfaction, when defending his unhappy course to his client.

THE CASE OF A FOURTH AVENUE LOFT BUILDING.

And I want to say right here, I think that process takes in practically 100% of the very large buildings in which

there is any possibility of installing a private plant. I wish you would let me give you one illustration, that of a building occupying a block front on Fourth Avenue, New York City. The engineer, one of the most eminent in the country, on consulting with the architect and the owners—the owners being a large estate—said, "Now for the heating, out of a total sum of $32,000, we must allow $22,000 anyway, whether we have an electric light plant or not," and the rest seemed very easy. I was asked to attend a conference. The building contained about 5,000,000 cu. ft. I said: "We will heat that building for $10,000, $12,000 less than the estimate of the engineer." This immediately prejudiced our point of view, the executors of the estate at once assuming that the other people were right, because we were so low. I think this is so interesting a subject that I am going to relate to you more of the details. Remember, it was a store and loft building on Fourth avenue, in New York City, with electric elevators. I saw at once that they had conceived a prejudice against our figures, so I said: "I will tell you what we will do; my own estimate is $7,500 for heating the building; but I made it $10,000 because I thought that was as low as we should go; I will give you a contract that you may call upon us to heat the building at any time for $12,000," and we so contracted. My friend, Ernest Graham, of the firm of D. H. Burnham & Company of Chicago, the architects of the Equitable Building, after I had told him about this, said before I had finished my story, "Hold on, and I will tell you what I think it will cost to heat that building." And he went through a mental process for two or three minutes and finally said, "$7,500." You see there are some architects who think straight and right! We never were called on to perform that heating contract, so it is alive today.

ALL LARGE ELECTRIC LIGHT AND POWER COMPANIES SHOULD HAVE STEAM HEATING DEPARTMENTS.

I could go on and tell you instances of this kind indefinitely, because I have been through so many of them; but the point I want to make is this: there is no large electric light and power company in this country that should not have a steam heating department composed of men who thoroughly understand every line of steam heating; and no company should ever be without means at its disposal to handle just such a situation as this to which I have referred. Your profession gains nothing, gentlemen, my profession gains nothing by having in it the slightest element of misrepresentation. And it gains nothing by maintaining methods and processes which, through failure to take advantage of modern invention and modern methods of meeting the needs of the public by the combination of various services, have become obsolete and wasteful or have failed to conserve the energy of the single units in the service of the public, as I before explained.

SMALL UNITS CANNOT COMPETE WITH LARGE UNITS.

We cannot, in my judgment, operate small units, either for steam or for light and power, in competition with large units. I realize, for instance, in regard to steam that there are stepping stones perhaps to be gone over before we reach the same relative results in regard to efficiency as in electricity. But even under the best conditions you cannot today operate small units as economically as you can large units. Where the end is, in regard to size and quantity of output, I do not know, and I do not believe anybody knows.

HOW THE OPERATING ENGINEER WILL BE BENEFITTED.

Now one last point on which I speak with a great deal of feeling. The professional men who are operating private plants, engines, dynamos and boilers, and also the operating force, say that the central station men are trying to get them out of their positions. That to me, if it were true, would be the saddest part of the whole thing. To my mind there is not one man in modern industry who is not benefitted by the processes that have arisen in the past through which human labor has been conserved, and human productivity enormously enhanced. The man who is firing a boiler, the man who is running an engine, the man who is oiling the engine, every man of this kind is today benefitted by the processes whereby human labor has been minimized and the

aggregate of human production increased. I can see that that process is going on in regard to these small units; so far as we are concerned, we have tried, and have always tried, to take care of labor. But as a matter of fact, I know of very few instances where a man who is running a small engine wants to take up larger team work. As a rule, he prefers to go out as an individual unit and take chances elsewhere when he has been displaced. A man in charge of a private plant, that is to say, a professional engineer, as a rule is a man of the highest grade, personally and technically; he is a man with a trade, and I have a great deal of respect for him. It is because of this that I want to say a word upon the subject.

OPERATING ENGINEERS WILL BECOME EFFICIENCY ENGINEERS.

If we could get into the minds of those men that they are too big and too worth while to work day after day and year after year in a small engine-room of a large building, with high temperature and an unsanitary office, if they would realize that they had it in them to become efficiency engineers, to take in a wider horizon of accomplishment for their employers, to take on added ability that would elevate them to higher positions where they would be relieved of the extreme attention to monotonous detail, they would see opened to them larger opportunities for usefulness and reward, and they would be introduced to a higher level of human effort and human living. If I might venture a suggestion, it would be an educational effort to point out to these men the opportunities that they have toward better management of these large structures. I think I may say that in the management of our large buildings we are practically standing today where we were standing twenty years ago. Owners do not realize that their properties need more careful management than smaller properties to make them successful and popular, and enable them to secure and maintain the good will of their tenants, who are their immediate public. To insure this, there must be efficient management from one end to the other; and the man that it pays to employ today, in the broad sense, is the man who is making the fight of his life to give a plant or large building that class of service and character of operation which is the furthest removed from obsolete methods.

Hot Water Heating for a Railroad Station in a Cold Climate

System Installed in the New Passenger Station of the Union Pacific System at Pocatello, Idaho.

When the question of heating the new passenger station for the Union Pacific system at Pocatello, Idaho, was taken up, three methods were considered and investigated. On account of cheap electric current, electric heating was thought of, along with steam and hot water heating. The engineering department finally decided to adopt hot water heating, as being more desirable from the standpoint of efficiency, economy and simplicity.

The installation was a difficult proposition from the standpoint of design for the reason that there is no basement under this building except at one end, and, consequently, all heating and plumbing piping, etc., was placed in trenches or tunnels under the floor of the building, shown in the illustration.

There are approximately 150 radiators and coils containing about 12,000 sq. ft. of surface. The power house or heating plant is located 600 ft. south of the depot building and contains 2 B. & W. boilers for furnishing steam to the steam lines in the train yard to heat coaches, etc. These boilers are in the room on the left side of the pump room.

The heating equipment, which is known as the Coogan system, is in duplicate. Each unit was designed of sufficient capacity to maintain the full guaranteed heating load at any time. The heating guarantees are based upon 10° below zero outside. During last Christmas and New Year's the coldest weather in thirty years was encountered at Pocatello. During this cold wave the thermometer

registered 18° below zero on several mornings and it is a matter of record that no complaint was heard from the hundreds of employees located in this building, which is a division headquarters and contains a large number of offices on the second and third floors.

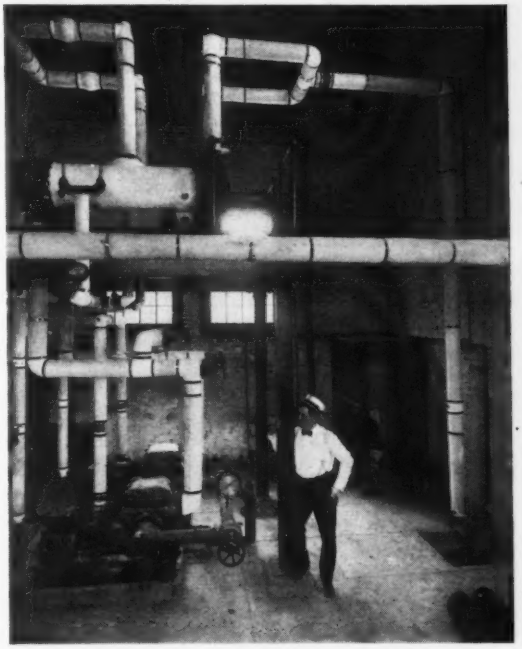
DETAILS OF EQUIPMENT.

As shown in the illustration, two Coogan convertors are set on a high platform and the circulating pumps are placed beneath them. The condensation from the convertor gravitates to a feed water heater in the boiler room, this being accomplished without the use of traps, etc. This condensation line from the bottom of the convertors is vented with large-opening air valves.

The flow and return mains between the boiler house and the depot building are carried inside of 16-in. vitrified tile and are laid on heavy wrought-iron stands without rollers of any kind, the heating lines sliding on top of the stands. In the center, between the buildings, a manhole contains two long-sleeve expansion joints. The total expansion has never exceeded 4½ in.

RESULTS OF INSULATION TESTS.

A test of the loss of heat from the two 4-in. lines in this conduit showed remarkable results. Thermometers were placed in the depot end and in the power house. With the flow water leaving the power house at 190°, there was a drop of only 1½° in the 575 ft. of actual heating line. Switching the thermometers and testing same for accuracy showed the same result. The heating lines in the conduit are not covered, but are kept in position in the center of the tile by braces placed



ARRANGEMENT OF HEATING SYSTEM FOR UNION STATION, POCATELLO.

at intervals. The dead air space all around the piping and the well-known heating insulating properties of the vitrified tile were credited with preventing loss of heat.

Although this conduit is placed only 2 ft. below the surface there were no indications of melting snow along the line. This remarkably small loss of heat was most interesting to the inspectors, as the theory advanced by the engineers for not covering these heating lines in the conduit was strongly opposed.

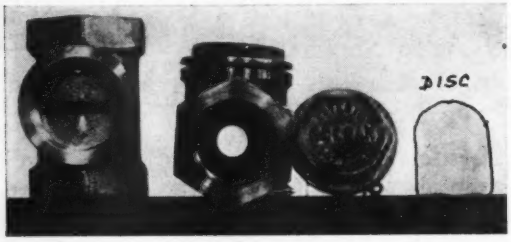
Each radiator and each coil in the station is furnished with a Coogan distributing valve which with this system be-

UNION STATION, UNION PACIFIC RAILROAD, POCATELLO, IDAHO.

comes a permanent fitting on the radiator or coil connection and cannot be interfered with after installation. The brass disc in the Coogan valve has an orifice, designed to be of the correct area to give each radiator and each coil its share or proportion of the flowing water so that it is impossible to short-circuit any radiator or coil.

The sum total of the area of the orifices in the various valves is less than the area of the 4-in. supply main, so that it makes no difference in the circulation whether any radiator or coil is open or closed while circulation is taking place.

The radiators and coils are each connected to mains with ¾-in. connections and are provided with modulation valves so that each radiator and coil can be controlled at will. Although all connections are ¾-in. the size of the radiators and coils range in units from 9 sq. ft. to 280 sq. ft., the latter being pipe coils on walls in the baggage room, etc.



COOGAN DISTRIBUTING HOT WATER VALVE.

All connections to radiators are made from behind the radiator and branches are run to each end of the radiator so that the usual stub connections are avoided. This method of connection, it is maintained, is clean and neat and permits of unlimited expansion and contraction. All radiators have high legs.

The flow connection is made to the top of the radiator and the return connection at the bottom of the radiator at the opposite end. Each radiator and coil is provided with a swing check valve on the return side, to permit the removal of the radiator at any time without the necessity of closing down and draining the mains or branches.

Another notable feature of this installation is the fact that at no time has any steam pressure been carried on the convertors. This is due to the fact that these convertors condense all of the steam entering into same at from 10 to 20 lbs. pressure on the steam line from the boilers. During last winter's cold spells the heating results stated were obtained with 200° F. temperature in the flow main at the conduit opening in the power house.

During moderate weather the operator controls the temperature of the water by hand adjustment of the steam valves from the boiler on top of the convertors and he can raise or lower the temperature by opening these valves more or less to meet atmospheric conditions. In average weather circulation is maintained at 150° F.

A pleasing feature to the Union Pacific engineers was the simplicity of care and operation, as well as the efficiency and economy of this system.

The designing and contracting engineers are the Jesse Coogan Engineering Co., Salt Lake City.

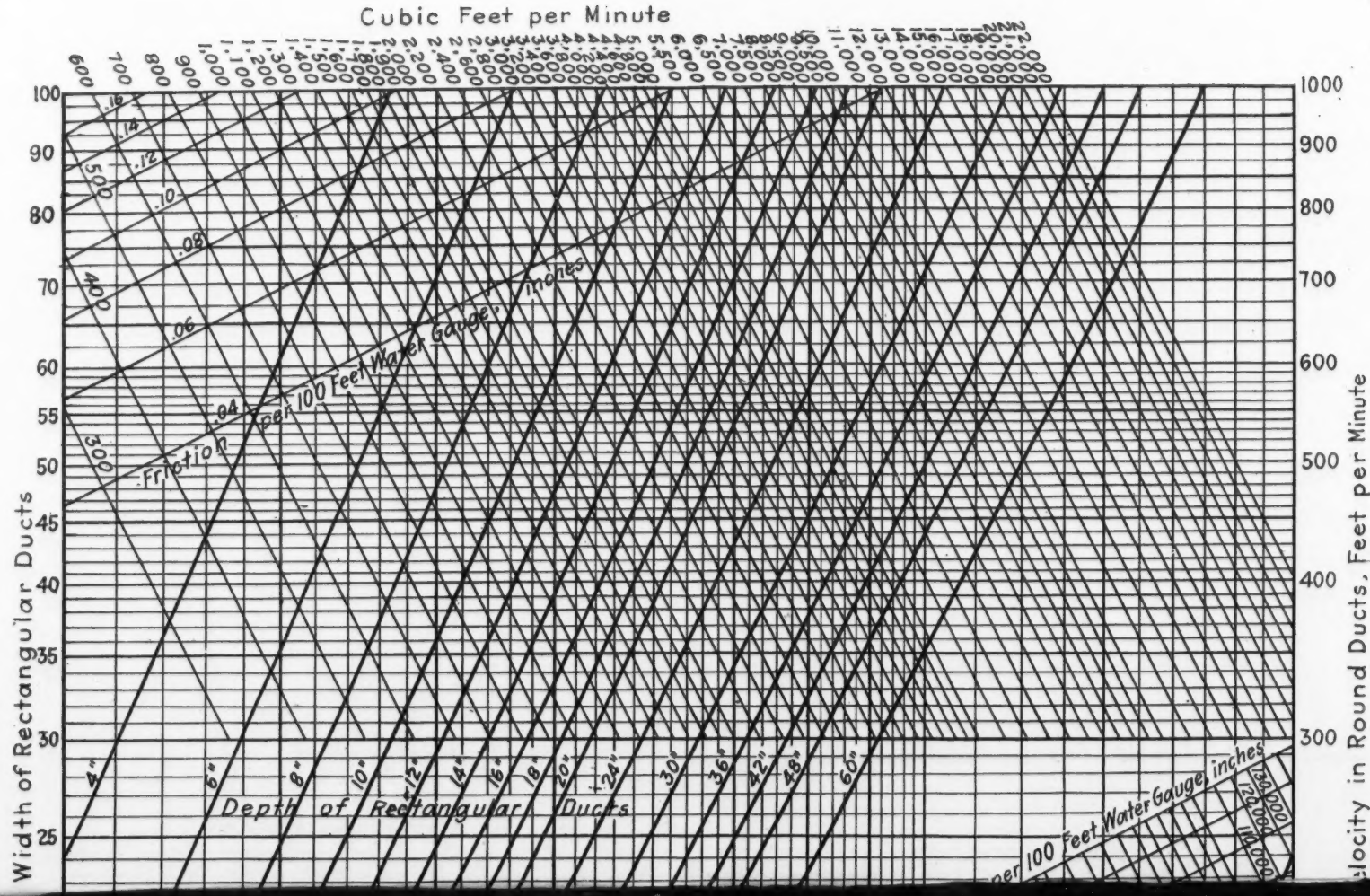
Chart for Figuring Round and Rectangular Ventilating Ducts

BY CHARLES A, FULLER.

A number of charts have been constructed for the determination of circular air ducts, but none heretofore, to the knowledge of the writer, which would apply satisfactorily to rectangular ducts. As rectangular ducts are used almost universally on account of space conditions, the writer has endeavored to construct a chart which could be used equally for round or rectangular ducts.

The accompanying chart is based upon the assumption that a duct system should be designed with a uniform friction drop throughout the various runs. The first part of the chart is constructed for circular ducts from the standard friction formula:

$$P = \frac{K S V^2}{A} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$


Cubic Feet per Minute
Width of Rectangular Ducts
Depth of Rectangular Ducts
Friction per 100 Feet Water Gauge, inches
Velocity in Round Ducts, Feet per Minute

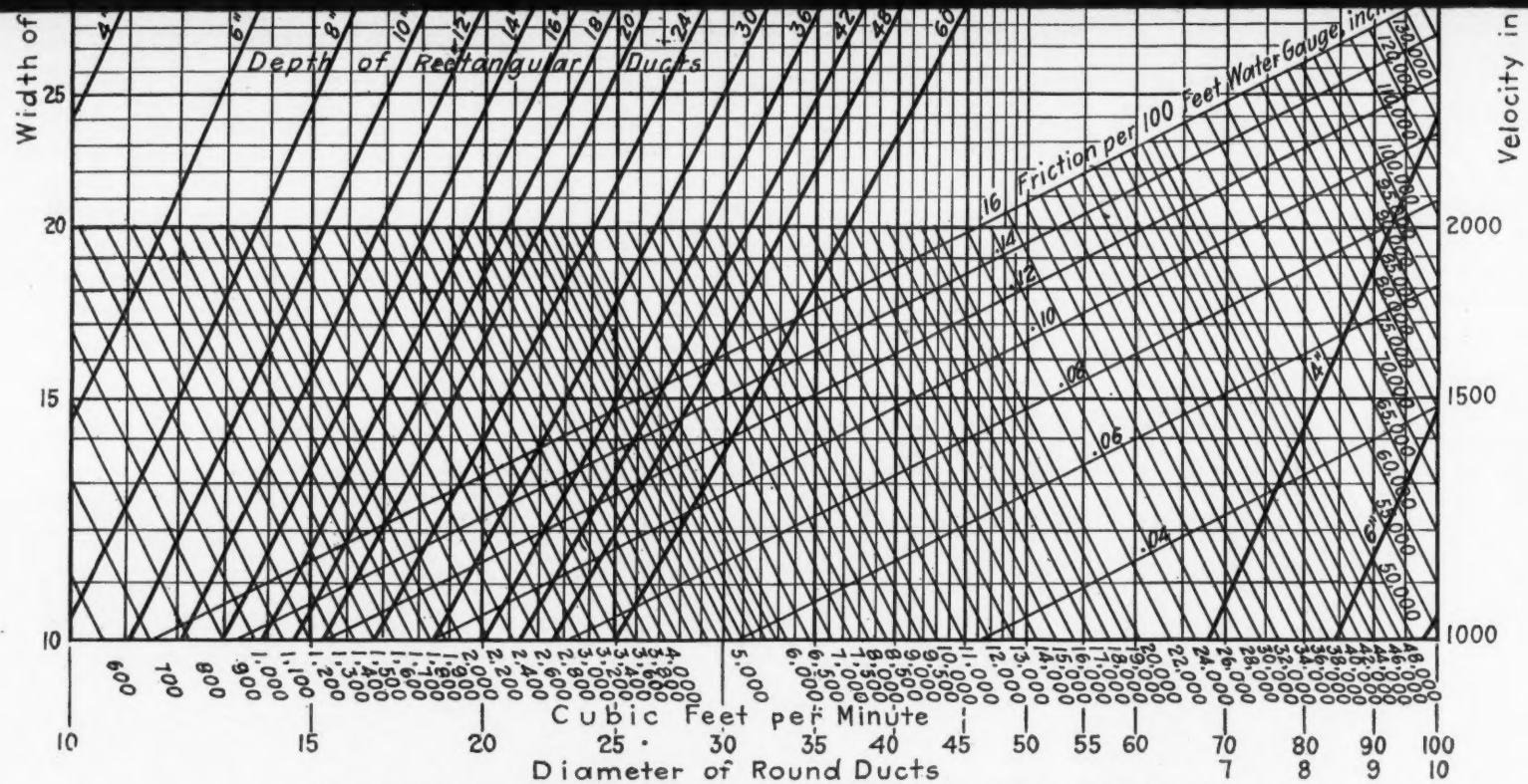


CHART FOR FIGURING ROUND AND RECTANGULAR VENTILATING DUCTS.

Designed by Charles A. Fuller.

(Supplement to The Heating and Ventilating Magazine. Vol. XIII, No. 8, August, 1916.)

in which the symbols are:

P = loss of pressure or friction in inches of water gauge.
K = constant, depending upon the construction of the duct.
S = total internal rubbing surface of the duct in square feet.
V = velocity of air in feet per second.
A = area of duct in square inches.

The value of K is usually taken at 0.0002 for galvanized iron, and 0.00028 for brick or concrete ducts.

The various values from this formula are plotted on the logarithmic scale and all curves become straight lines because of the exponent of V in the second member of the equation.

The diameters of round ducts are given along the bottom of the chart from 10 in. up to 100 in. and are represented by the vertical lines. The values from 7 in. to 10 in. are also inserted along the bottom at the right hand side of the chart.

A word should be said about the way the chart is divided. The friction curves, for instance, which are found at the bottom, are repeated in the upper left-hand corner. Again, at the right hand side of the chart it will be noticed that the velocities in the round ducts, starting from the bottom, are from 1,000 ft. per minute up to 2,000 ft. per minute. The upper part shows the velocities from 300 to 1,000 ft. per minute.

DEVELOPMENT OF THE CHART FOR RECTANGULAR DUCTS.

In order to make the chart applicable to rectangular ducts, it was necessary to determine the relative carrying capacity of rectangular and circular ducts. That is, with a given quantity of air flowing through a round duct, with a certain friction loss, it is necessary, we will say, to determine the size of a rectangular duct, when one side is given, which will carry the same quanity of air with the same friction loss. The velocity in the rectangular duct will be less, due to the relatively larger rubbing surface compared with the sectional area.

In the formula for friction loss given above, V may be expressed in terms of the quanity and the area of the duct or

$$V = \frac{Q}{A}$$

in which Q represents cubic feet per minute and A represents the area of the duct in square feet. Subsituting these values in equation (1) we have

$$P = \frac{K S Q^2}{A^3} \quad \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Expressing A and S in terms of the diameter of a round duct and assuming 100 ft. of straight duct, equation (2) becomes

$$P = \frac{6400 K Q^2}{\pi^2 D^5} \quad \ldots\ldots\ldots\ldots\ldots\ldots (3)$$

A similar expression may be written for a rectangular duct by substittuting a and b, the two sides of the duct, for A and S in equation (1) with 100 ft. of straight duct and the equation then becomes

$$P = \frac{200 K Q^2 (a+b)}{a^3 b^3} \quad \ldots\ldots\ldots\ldots\ldots\ldots (4)$$

If the two ducts are to have the same friction loss per 100 ft. of length, equation (3) and (4) are equal:

$$\frac{6400 K Q^2}{\pi^2 D^5} = \frac{200 K Q^2 (a+b)}{a^3 b^3}$$

The two ducts are to have the same carrying capacity and to be constructed of the same material. Therefore, Q and K may be dropped from each side of the equation, which gives the following:

$$\frac{6400}{\pi^2 D^5} = \frac{200 (a+b)}{a^3 b^3} \quad \ldots\ldots\ldots\ldots\ldots\ldots (5)$$

Solving this expression for D gives:

$$D = 2 \sqrt[5]{\frac{a^3 + b^3}{\pi^2 (a+b)}} \quad \ldots\ldots\ldots\ldots\ldots\ldots (6)$$

Referring now to the chart, various depths of rectangular ducts have been assumed and the widths solved from formula (6) for different values of D. These values have been plotted in the form of curves by using the same curves for D obtained from equation (1).

From the chart, therefore, the dimensions of either round or rectangular ducts may be determined directly for any given quantity of air and any desired friction drop.

The velocities given at the left, however, apply only to round ducts.

EXAMPLE OF USE OF CHART.

To illustrate the application of the chart, assume that the system is to be designed on a uniform friction drop of 0.08 in. of water per 100 ft., which will apply to the average ventilating system. Assume also that the quantity of air to

be delivered through a particular duct is 4000 cu. ft. per minute and that the space conditions permit of a duct 16 in. deep.

Find the intersection of the 4000 cu. ft. line with the 0.08 in. friction line. From this point, follow up vertically to the curve representing the 16-in. depth of duct. Follow thence horizontally to the left, where the proper width of the duct is found to be 37 in.

The friction drop per 100 ft. upon which to design any particular system may be determined either upon a basis of a maximum allowable velocity or upon the total friction loss of the system.

Heat Transmission Through Building Materials

Tests That Show a Higher Average Heat Loss Through Glass Than Is Generally Estimated.

By JOHN R. ALLEN.

(*Read before the American Society of Heating and Ventilating Engineers, Detroit, Mich., July* 19-21, 1916.)

The rate of heat transmission through building materials is a subject of fundamental importance to heating and ventilating engineers. There are many conflicting data having very little experimental foundation to establish their accuracy. About six years ago the writer constructed apparatus to determine experimentally the heat loss through building material.

This apparatus consists of a wooden box, as shown in Fig. 1. The box is 6 ft. long, 4 ft. wide and 4 ft. high on the inside. The walls are 11 in. thick and are heavily insulated with wood, air space and cork. The cross section of the insulation is shown in Fig. 2. One side of the box may be removed and in this open side the different building materials may be constructed for test purposes. The box itself is on trunnions so that it may be turned in any position, enabling the material to be tested as a floor, as a wall or as a ceiling; it is also possible, as in case of roofing material, to place the box at any angle. The box was originally placed in a room having a constant temperature so the room could be maintained at 70° F. A brine coil was placed in the box, through which cold brine could be circulated, so that the inside of the box could be maintained at a low temperature. The difficulty, however, of weighing the brine and measuring the difference of temperature where it entered and where it left the box involved so many errors that this method was abandoned.

HOW THE BOX IS HEATED.

The box has since been placed in a shed out doors, where it is free from currents of air, and the box was heated, The outside of the box was subject to ordinary atmospheric conditions while the inside of the box was maintained at uniform temperature by electric heaters. These heaters consisted of ordinary carbon filament lamps, supported from a central shaft. As the box was rotated these lamps maintained the same relative positions. The electric lamps were screened by double shields of brown paper in order to reduce the radiation of heat, and protect the electrical thermometer from radiant heat. By turning the lights on and off a uniform temperature could be maintained in the box. A recording wattmeter was used to measure the electrical energy given to the box. This electrical energy can be readily reduced to the heat equivalent.

The temperature inside of the box was determined by eight electrical thermometers placed in different parts of the box. A multiple point switch enabled the observer to read all these thermometers on one Wheatstone bridge. Before being placed in the box these thermometers were all carefully compared. A continuous recording thermometer was also used to determine the inside temperature of the box. The outside temperature of the box was determined by six mercury

FIG. 1—INTERIOR OF TESTING BOX, SHOWING ARRANGEMENT OF THERMOMETERS AND HEATERS.

thermometers, each on a different side of the box. A continuous record of the outside temperature was also kept by a recording thermometer.

In order to determine the effect of rain on the coefficient of transmission, two rows of spray nozzles were arranged so that the material to be tested might be covered by a film of water. The effect of wind was determined by delivering air in a thin film across the surface of the material to be tested, the air velocity being produced by a blower driven by an electric motor. The air was delivered across the whole length of one side of the surface of the material to be tested. The arrangement of spray nozzles and air pipe is shown in Fig. 3.

METHOD OF TESTING

Each test was conducted with all conditions as nearly constant as possible. Particularly, care was given to maintaining a uniform difference in temperature between the inside and the outside air, and the heat input was left constant during any test or series of tests. The length of these tests was largely determined by the outside temperature, it being desirable to have a period of at least four hours of constant temperature previous to the beginning and ending of each test. Most of the tests covered a period of about 12 hours of almost constant temperature.

Other tests were made covering long periods of fluctuating outside temperature. In such cases the tests were started and finished after at least four hours of constant outside temperature, and the temperature at the beginning and the temperature at the end were the same. This avoids the necessity of correcting for the amount of heat contained in the material of which the box is constructed.

Before commencing an experiment with any given material it is necessary to determine the radiation loss from the box itself. For this test, a side constructed in the same manner as the rest of the box was placed in the open side

of the box. A coefficient was determined for the outside surface of the walls, and this was applied to all the surface exposed to outside temperature. This calibration test gives a loss of 798 B.T.U. per hour per degree difference of temperature from the insulated sides of the box, when the center of the wall of the tested material is 10 in. from the face of the box. When the tested material is flush with the face of the box, the loss is 749 B.T.U. per hour per degree difference of temperature.

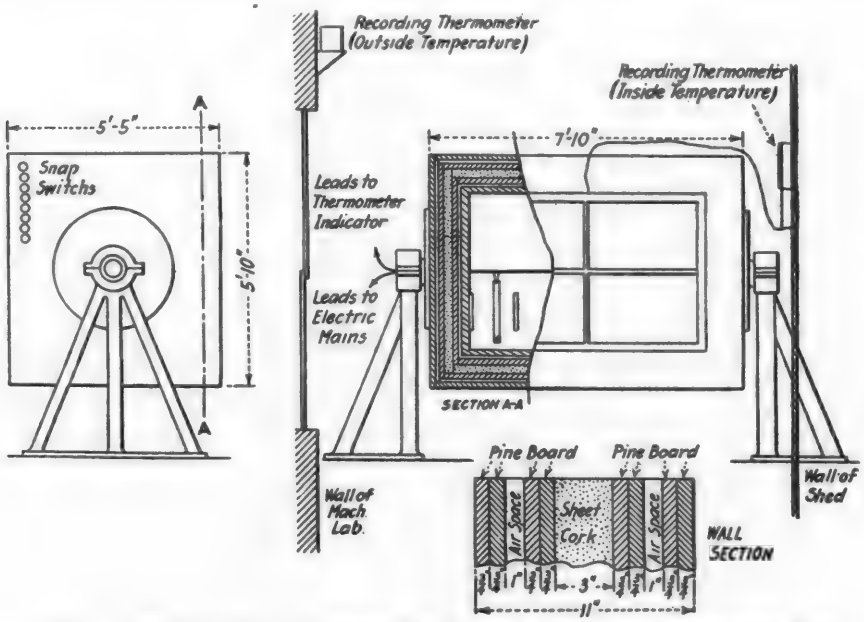


FIG. 2.—DETAILS OF CONSTRUCTION OF THE WOODEN TEST BOX.

CONDITIONS OF THE TEST

The only material that has been tested with this device, up to this time, is glass. The tests have been divided into two series. The first was to determine the coefficient K for glass used as a window, a floor, a horizontal roof, and a roof at an inclination of 45 deg. The second series of tests was made to determine the coefficient of heat transmission for glass in a vertical position and subject to an atmosphere without wind or rain, with a violent rain, with a violent wind, and with rain and wind.

In the first series of tests the glass was set back 10 in. from the face of the box, while in the second set of tests the glass was placed flush with the face of the box.

RESULTS.

The results of the tests appear in Tables 1, 2, 3 and 4, as follows:

Table I shows the result of the calibration test and gives the value of K for the insulated box;

Table II shows the results of the test for the determination of the value of K for the glass in different positions;

Table III shows the results for the value of K subject to wind and rain. The velocity of the wind was about 37 miles per hour in these tests;

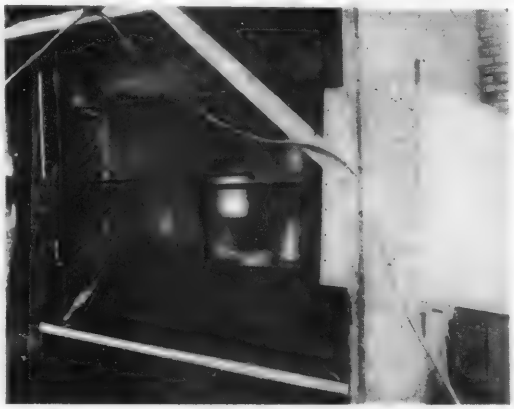


FIG. 3.—SPRAY NOZZLES AND AIR DUCT FOR PRODUCING EFFECTS OF WIND AND RAIN.

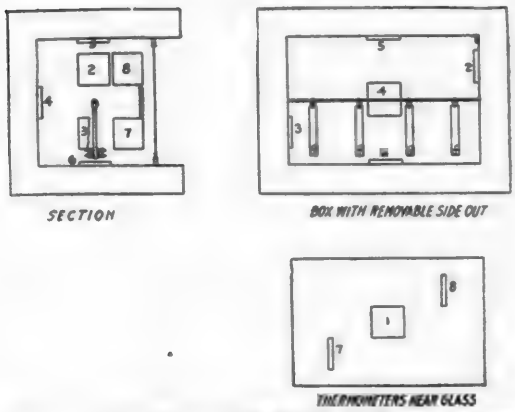


FIG. 4.—DIAGRAM OF TEST BOX, SHOWING ARRANGEMENTS OF ELECTRIC THERMOMETERS AND HEATERS.

Table IV is a summary of the results and shows a probable limit for the value of *K* for all the tests under the various conditions.

DISCUSSION OF RESULTS.

You will note from the results shown that the heat transmitted is almost the same whether glass is used as a ceiling or as a wall, but when used as a floor there is a marked reduction in heat transmitted.

The second part of Table 4 gives us some idea of what a large effect wind and rain have upon the coefficient of heat transmission. The rain increasing the heat transmission to a greater extent than the wind alone, most authors assuming the heat transmission through glass is 1 B.T.U. per square foot per degree difference of temperature and from these experiments we see that this corresponds to a condition of dry glass with a strong wind blowing. If we add to these conditions a heavy rain, the value of the coefficient is increased about 50%.

TABLE 1. CALIBRATION TEST ON THE BOX WITH AN INSULATED WALL IN THE OPEN SIDE.

1. Test No. 17. From 9 a. m., Feb. 27, to 6 a. m., Feb. 29; duration 45 hours.
2. Average of 7 electrical thermometers inside box, deg.... 94.01
3. Average of 6 mercury thermometers outside, deg..... 17.91
4. Temperature difference, deg.... 76.10
5. Watts .....185.
6. B.T.U. per watt per hr. $\frac{134 \times 33000 \times 60}{778 \times 100}$ 3.411
7. B. T. U. Input (3.411x185).... 630.
8. B. T. U. Loss per degree difference in temperature..... 8.2816

TABLE 2.—TESTS TO DETERMINE "K" FOR DIFFERENT POSITIONS OF THE GLASS.

Test No.	18	19	28	23	29	15	21	21	21	14	20	5	11
Position	Glass in vertical position					Glass as a ceiling				Glass as 45° skylight		Glass as a floor	
Date, 1916	3/27	3/29	5/3	5/3	5/3	2/18	4/9	4/9	4/11	2/12	4/1	1/28	2/2
Duration, hrs.	26	48	186			11½	52			9	96		
Instantaneous Read.				8 A.M.	8 P.M.			6 A.M.	10 A.M.			1½	2¼
Avg. Temp. inside	88.2	22.2	130.3	128.2	131.2	72.1	88.7	80.2	87.2	75.1	91.6	70.2	78.7
Avg. Temp. outside	40.4	44.6	50.7	45.2	50.2	14.5	40.7	33.2	41.2	13.1	42.8	29.7	18.7
Temp. diff.	48.8	47.6	82.6	83.0	81.0	57.6	45.0	47.0	46.0	62.0	49.0	40.5	60.0
Watts	354	328	566	566	566	392	310	310	310	388	313	283	386
B.t.u. input	1207	1119	1930	1930	1930	1305	1056	1056	1058	1323	1067	965	1313
B.t.u. loss thru wooden sides	360	360	660	662	646	460	369	376	367	495	391	371	479
B.t.u. loss thru glass	817	739	1270	1268	1284	845	689	683	691	828	676	594	834
K	0.698	0.647	0.640	0.637	0.660	0.611	0.638	0.606	0.628	0.557	0.575	0.470	0.579
K corrected	0.460	0.577	0.613				0.525						

TABLE 3.—TESTS TO DETERMINE K FOR GLASS AS A WALL SUBJECTED TO RAIN AND WIND.

Test No.	24	24	26	26	26	26	26	28	29	29	30	31	31	33	33
Condition	No wind or water								Water		Wind	Water and Wind			
Date, 1916	5/11	5/14	5/17	5/17	5/18	5/10	5/17	5/22	5/30	6/2	6/7	6/8	6/9	6/9	6/10
Duration, hrs.	70		48				112		120		12	6		48	
Instantaneous Read.		8 A.M.		6 P.M.	6 A.M.	6 A.M.		8 A.M.		4 A.M.			6 A.M.		6 A.M.
Avg. Temp. inside	135.8	133.2	117	116.2	119.2	128.7	122.1	125.7	106.7	103.7	109.6	90.7	95.2	94.2	92.2
Avg. Temp. outside	55.7	51.2	46.2	47.2	42.2	47.2	50.4	54.2	62.6	61.2	56.5	54.7	54.2	55.8	54.2
Temp. Diff.	80.1	82.0	70.8	69.0	74.0	72.0	71.1	74.5	43.5	44.5	53.1	42.0	41.0	38.4	38.0
Watts	554	554	481	481	481	481	481	481	481	481	481	481	481	481	481
B.t.u. input	1890	1890	1640	1640	1640	1640	1640	1640	1640	1640	1640	1640	1640	1640	1640
B.t.u. loss thru wood	660	615	530	517	555	539	537	558	328	332	375	314	307	288	282
B.t.u. loss thru glass	1230	1275	1110	1123	1085	1101	1103	1082	1312	1307	1265	1326	1333	1352	1358
K	0.671	0.647	0.654	0.676	0.611	0.627	0.641	0.605	1.248	1.222	1.05	1.316	1.350	1.408	1.485
K corrected	0.698		0.657				0.661								

9. Outside surface of box..... 250.
10. "K" for outside surface..... 0.03302
11. Outside surface exposed with glass set in 10 in.....241.8
12. Heat loss through outside surface exposed (241.8x0.03302 B.T.U.) 7.984
13. Outside surface exposed with glass flush 226.8
14. Heat loss through outside surface (226.8x0.03302 B.T.U.) 7.489

While a rain never occurs in zero weather it is possible that a fine snow might occur at very low temperatures. In this case the melting of the snow on the glass would give practically the effect of a wet glass at a very low outside temperature. It would seem therefore that the coefficient used for glass should be increased. The experiments show that this coefficient should be 1.48 or approximately 1.5. This would more nearly represent the maximum loss from glass than the coefficient 1, which is used at the present time.

The University of Michigan expects to carry on this line of experiments for a series of years. We shall next take up plate glass, then cement and other forms of building material.

TABLE 4. UPPER AND LOWER LIMITS, AND PROBABLE VALUE OF "K" FOR ALL TESTS.

I. Glass subject to ordinary atmospheric conditions and set in 10 inches from the face of the box.

	Limits	Probable value of "K"
Glass vertical	0.577-0.660	0.630
Glass horizontal on top.....	0.525-0.638	0.610
Glass inclined at 45 deg.....	0.557-0.575	0.575
Glass horizontal on bottom..	0.47 -0.479	0.47

II. Glass flush with the part of the box and subject to wind and rain.

	Limits	Probable value of "K"
Quiet conditions	0.601-0.693	0.641
Rain, no wind.....	.....	1.248
Rain and wind.....	.....	1.485
Wind blowing, no rain.....	.....	1.05

For Closer Co-operation Between the Manufacturers and Contractors of Heating Apparatus

By FREDERICK W. HERENDEEN,*

Secretary of the National Boiler and Radiator Manufacturers' Association.

I can imagine no two associations whose relationship should be closer than our two associations.

It would seem eminently fitting that the members of the Master Steam and Hot Water Fitters' Association should know just what the National Boiler and Radiator Manufacturers' Association is organized for, just what work it is doing and just what it is trying to accomplish. Therefore I will read you our constitution and by-laws. They are as follows:

CONSTITUTION AND BY-LAWS.

"*Name*—This Association shall be known as the 'National Boiler and Radiator Manufacturers' Association."

"*Object*—The object of this association shall be to promote the interests of the boiler and radiator industry along those lines wherein experience has shown that concerted rather than individual effort is necessary, and in pursuance of this object it is the purpose of the association to provide a central organization, which for the benefit of all members and the industry in general shall, as occasion may require, investigate, report and take the necessary action with respect to general questions affecting the industry.

"While obviously impossible to foresee and record these questions which may from time to time engage the activities of the association, it is apparent that diligent attention is required in connection with legislation affecting the industry, and which is being projected in ever-increasing scope and volume. It is not only essential to the interests of manufacturers of boilers and radiators, but likewise to the interests of the steam fitting trade as installers, and to the public in general as users of steam and hot water heating apparatus, that the knowledge and experience of those in the industry be readily available through a central agency for the use of those sponsoring legislation affecting the employment of such apparatus.

"Unified effort is similarly required in

*From a paper read before the National Association of Master Steam and Hot Water Fitters.

dealing with the matter or freight tariffs, classifications, etc., the carriers desiring and requesting that such questions affecting any given industry as a whole be presented and sponsored by some responsible agency acting for all those concerned.

"This association shall at no time take any action which shall violate in spirit or substance the provisions of the common law or of any present or future statute, Federal or State, dealing with monopolies, restraint of trade, the fixing of prices, the division of selling territory, the restriction of output, or other related subjects, it being distinctly understood that all such matters are beyond the purview of this association."

A year ago at your annual convention, Mr. Foster briefly told you about the activities of our association in watching State laws that were proposed, and in some cases enacted, that vitally and fundamentally had to do with your business and ours.

DANGER OF ILL-ADVISED LEGISLATION.

We have continued to carefully keep track of the laws proposed in the various States convening this past year. You may be interested in knowing that, although there were only eight State legislatures convening this past year, over forty bills were introduced affecting in one way or another your interests and our interests. Bills which, if enacted, would have compelled compulsory inspection of low pressure heating boilers, with an annual inspection fee, to be paid by the users, of from three to five dollars. Bills which, if enacted, would have rendered necessary a State licensed fireman to fire a small, low pressure heating boiler.

Many of these bills were introduced into the various legislatures by various interests, whose knowledge of the requirements of a low pressure heating boiler was extremely limited. But had the bills been enacted, as introduced, serious damage would have been caused your interests as well as ours.

Next year when all of the State legislatures convene, undoubtedly many detrimental bills will be introduced. Our association will continue to keep a watchful eye on all bills and to advise your secretary, as we have in the past, where the unreasonableness and injustice of a bill makes team work desirable.

THE A. S. M. E. BOILER CODE.

You are undoubtedly familiar with the boiler code as promulgated by the American Society of Mechanical Engineers, commonly known as the A. S. M. E. Code.

There is a society called the American Uniform Boiler Law Society, of which our association is a member, whose endeavor is to introduce this code in the various States. Our activities along this line are to see that nothing is added to the code by the various States, which would deprive the public of the sanitary and economic advantages of low pressure heating apparatus. Again, we have been aided many times by your secretary, and hope that your association and ours can work side by side on all matters which affect the public interest and that of the heating contractors and manufacturers.

CO-OPERATING WITH BOILER INSURANCE COMPANIES.

Our association has had meetings with several of the prominent boiler insurance companies, with a view to having them become better acquainted with the product which we manufacture, and which you so generally install, believing that through co-operation and a better mutual understanding, the interests of these companies as insurers of boilers, of the public as users of boilers and buyers of insurance and of the members of your association and ours, as installers and manufacturers, may all be advanced.

KEEP WATCH ON FREIGHT RATES.

You may be interested in knowing that in the United States there are four freight classification committees, whose powers are very large. Naturally, the railroad tonnage, in carrying the finished product of low-pressure steam and hot water boilers, and steam and hot water radiators, together with the tonnage of the raw material, inbound to the factories, such as coal, coke, sand and boxing lumber, is an enormous tonnage. Our association is rightfully interested in the activities of these freight committees, and very naturally oppose, as we have opposed a number of times, what we consider improper freight rates; and to insist that the product we manufacture is properly carried at proper rates.

Again your interests and ours are mutual because, as we lend our efforts

along the lines of proper freight rates and conditions for the great industry of low-pressure steam and hot water heating, made more general and more generally obtainable, we have helped your interests, just as we are helping our own.

In other words, it is our earnest desire to give our attention to any and all proper subjects coming within the scope of our constitution and by-laws that have to do with the product we manufacture and sell—whether it be primarily something that interests us as manufacturers, or interests you, the trade through whom we sell our product.

RESPONSIBILITY OF CONTRACTORS TO MAKE BUSINESS PROFITABLE.

We are naturally so interested in the master steam and hot water fitters and their success that we venture to take advantage of this opportunity to dwell upon a few matters apparent to the manufacturers, without imposing too greatly on your time and good nature; and with the wish that you will accept our thoughts in the spirit they are offered, believing that benefit will accrue which will be mutually helpful.

Your organization has a duty to perform, not only for the benefit of its members but to the industry in general and to the public whom you serve. The responsibility rests upon you to make this business—the heating contracting business—one which shall yield an adequate return on capital and labor invested in it by you, for without this foundation there can be no development.

There are times when it seems difficult to appreciate the real meaning of associated effort in an industry. But our experience is that the only way in which general good can be accomplished and reasonably fair conditions maintained, is through an interchange of thought and ideas, drawn from collective funds of knowledge and experience, all of which makes for sound conclusions.

HEATING BUSINESS NOT NOW ON PROFITABLE BASIS.

We have mentioned an adequate return on brains and capital invested as one of those fundamentals on which progress in any industry must be predicated. It has been reflected to us time and again that the heating contracting business, generally speaking, is not on a profitable basis. If this be true, the question then that naturally presents itself is, "Why?" We are advancing not our own opinion, but that of those best qualified to deal with the subject when we say that primarily such a condition must be due to a failure to co-ordinate those fundamentals necessary in every business, namely, cost, overhead and profit.

COSTS NOT PROPERLY FIGURED.

I do not believe I shall be accused of exaggeration when I say that some considerable percentage of the individuals engaged in the heating contracting business are not acquainted with the essentials which must be taken into consideration when figuring costs; nor have they taken the time necessary to ascertain exactly what their overhead expense is. It is a regrettable fact that too often costs represent material and labor, and the profit, added to such a figure, is really not profit at all. The question of overhead expense is either overlooked or guessed at. And, in a very large and ever-increasing number of cases, contracts secured on this basis by the trade represent a possible loss rather than a sure profit. Such a condition is unfair to all concerned—to the contractor, the manufacturer and, less directly but just as surely—to the buying public.

COMPETITION NOT THE CAUSE OF FAILURES.

Statistics of failures, prepared by the Bradstreet Company for the year 1915, develop the fact that competitive conditions are credited with only 5.7 per cent. of the failures; on the other hand, two prominent features that make for failures are incompetence and lack of capital. In the face of this authentic report it would seem wise for us all to keep constantly before us an educational campaign that makes for a fundamental knowledge of the elements entering into business life which makes for failure or success.

VALUE OF CREDIT.

It might be in order at this time to comment briefly on the attitude of many heating contractors in connection with the question of credit. This attitude, in a large number of cases, is such as to make it appear to us as though tradition had ordained that the manufacturer furnish some considerable part of the working

capital necessary for the heating contractor's business without charging any interest.

This particular feature might not be questioned so much; but, when the customer takes it for granted that this working capital, in the shape of credit, should be furnished him without his having to submit any facts or figures, that would justify the amount involved, it becomes more serious. Is it not fair to say that when a manufacturer exhibits his confidence as represented by the line of credit granted, he is entitled to reciprocity to the extent—at least—of having submitted to him a financial statement showing the existing conditions?

USE OF BANKING PRIVILEGES.

The heating contractor is not always familiar with the facilities that he, as a customer of a bank, is entitled to enjoy. He is perhaps inclined to look upon his bank solely as a convenience to be used for deposit and checking purposes. This naturally works a hardship on the manufacturers and jobbers who are compelled, on account of business conditions, to assist in capitalizing many of the trade who, by reason of their ability, integrity and character of their contracts, are logically entitled to an accommodation from their banks.

Practically all the mercantile and manufacturing interests, at certain seasons of the year, make use of their banks to tide the gap which exists between the placing of merchandise in stock and turning it into money. In our opinion it is entirely consistent, and along good business lines, for a merchant to make his bank a partner in his enterprise, and there is no reason why the heating trade should not endeavor to work along the same lines as the average mercantile establishment.

Banks must have borrowers in order to prosper, and there will be found to be a surprisingly large number of cases in which they are glad to accommodate, with reasonable loans, those customers who have occupied the position of depositors only. This is, of course, predicated on the customer's ability to demonstrate that they are worthy of confidence, and are in position to reflect the progress of their business. You should not hesitate to discuss your affairs, freely and frankly with your banker. Credit is built largely on confidence—the personal equation of the borrower is a vital factor.

CONDITIONS FOR SECURING CREDIT.

The applicant for credit at the hands of a bank should be prepared to give a concise history of his business and the conditions which make it necessary for him to seek a loan. If he is possessed of ability and integrity, and shows evidence of having made progress in his business, there is no reason why his bank should not grant favorable consideration to his request.

The heating contractor, providing he is otherwise entitled to confidence, has something substantial in the way of contracts, or accounts receivable, that are held up either through deferred payments or awaiting the completion of work by others than himself. He is not buying seasonable merchandise, subject to depreciation to put in stock, but has a market for his purchases at the time he places his order.

If the conditions surrounding his contracts are such that payments do not materialize in time for him to take care of his bills within regular trade terms and thereby maintain his credit standing with the manufacturers and jobbers, he should canvass the situation with his banker for the purpose of negotiating a loan that will help him over the gap between the time his material bills fall due and the payments come in on contracts.

It is fair to assume that bankers are favorably disposed toward the progress and promotion of commerce and industry. We feel that credit will be extended to those who prove their worthiness and who make use of same for legitimate commercial purposes. It will operate to the advantage of the industry as a whole if the trade will keep more closely in touch with and make full use of their banks.

BORROWERS LEARN TO SAFEGUARD THEIR OWN CREDITS.

In this connection, the value of the contract between the heating contractor and the banker should not be overlooked. It will serve to impress the borrower with the importance of safeguarding his own credits and cause him to look more carefully into the credit risks surrounding the work on which he figures.

The banker, by virtue of the place he occupies in the commercial world, and his knowledge of general conditions, is in position to advise his customers, and educate them along the lines of credit conservation by causing them to exercise good judgment in connection with the contracts they make. Bankers, as a general rule, are conversant with the facts surrounding the financial and mercantile interests in their community, and their advice and counsel are well worth seeking.

USE AND ABUSE OF CASH DISCOUNTS.

Before concluding these remarks, I wish to call attention to the use and abuse of cash discounts. Many of the trade do not realize the attractiveness of cash discount terms. Where the terms of sale are sixty days net, or 2 per cent. for cash in ten days, it means that if the customer will pay his bill fifty days before it matures, he is allowed the privilege of deducting 2 per cent., which is equivalent to allowing the buyer a rate of 14 2-5 per cent. per annum on the money required for prepayment. It requires but an ordinary knowledge of mathematics for the heating contractor to apply this example to his own business. Taking his volume of purchase into consideration, he will be able to prove to his own satisfaction that the question of cash discount forms one of the best foundation stones to a profitable business. This is the use of cash discounts.

The abuse consists in the customer's failure to recognize the essential features of cash discount terms. Such terms are a definite item in fixing the price at which merchandise is sold, and the premium for prepayment is too great to permit customers to interpret cash discount terms to suit themselves. It is just as unfair to expect a manufacturer to accept a settlement on which cash discount has been deducted four, five or ten days in excess of cash discount terms, as it is to arbitrarily deduct a 5 or 10 per cent. extra discount from the price quoted. Strange to relate, there are some concerns whose business principles are beyond criticism save that they habitually try to take advantage of extra time in deducting cash discount. We believe the Golden Rule should apply, and customers taking advantage of cash discount terms should see to it that settlements are made promptly and not allowed to ride an extra few days.

The Relations Between the Architect and the Master Steam Fitter

By D. KNICKERBACKER BOYD.

(*From an address before the National Association of Master Steam and Hot Water Fitters.*)

In the matter of direct letting of contracts, I have read all the literature on the subject, including your own "Report on the Evils of Sub-contracting." I can subscribe to the principal objections which you raise because I know that these evils have existed, but you must not condemn all general contractors. And, after all, what you are aiming to change it seems to me, is not so much the sub-contracting evil as the sub-estimating principle.

I personally feel that too much stress has been laid on the sub-contracting evil without due regard to any perfectly feasible plan of controlling the estimating. Perhaps you have found this method the means of most quickly checking an abuse rather than the slower process of education.

All branches of the building trades have suffered alike from the "farming" and "huckstering" of sub-estimates and dickering with sub-contractors which is practised by some, but by no means all, general contractors. Sub-contractors who allow themselves to take part in this are equally at fault.

When work is awarded under one general contract, architects can help all the trades and very largely control the whole situation by requiring that a complete list of all sub-contractors be submitted with the estimate, the same to be subject to the

approval of the architect and not to be changed without consent after the contract is awarded.

In my own practice we invariably do this, to protect all interests and insure a selection of capable men. But in the case of heating we practically always take the estimates direct, and, whenever possible, do the same with plumbing. We turn over the lowest of these to the general contractors, who estimate with the understanding that they must accept them as sub-contractors' bids if they want the contract.

This gives us the opportunity to carefully select the bidders—a most important consideration. Only the men we deem best qualified to do work of the kind and size in hand are asked, and the number limited to from three to five. This is quite sufficient. Others should not importune for the privilege and so lessen their prestige. Architects should be resolute and not allow any one to estimate who does not do the high grade of work as those selected. This will save disappointments and insure to all an equal chance on the basis of good work. Under these favorable conditions the lowest figure should prevail in the award. Under general and open competitive bidding the low estimate is often to be regarded with suspicion.

In selecting those to whom they will entrust the work, architects ought to inquire and know whether they have the respect and confidence of their associates, as well as whether they are members of their respective associations. In this way architects can help to control the situation and you can cooperate with them in many ways.

In some of the States where the separate contract law obtains, annoyance is often caused because the heating, plumbing and electrical work cannot when desired be incorporated in the general contract for State and municipal buildings. If all the contracts were separately let, and there were no general contractor, the situation would be quite different. So would it be if, after securing separate estimates on the mechanical equipment, in the manner I have indicated, the contractors for these branches of the work, upon approval as to their fitness, could become sub-contractors to the general contractor. While this would cost the owner more, it would insure a unified responsibility for the completion and term maintenance of the building, and would simplify the course of procedure throughout the work. Under the existing conditions contractors are often working at variance and the way is open for constant dispute and discussion as to interference, delay, responsibility for damage and defects.

HOW TO OBVIATE LOSSES DUE TO ESTIMATING AS SUB-CONTRACTORS.

The contention made by your committee that estimating as sub-contractors to all general contractors involves a loss to the trade is well founded, and worthy of every consideration. The difficulty would, however, be obviated if architects were required to take separate estimates just as at present, under the law referred to, but could have the option of incorporating these into the general contract under proper conditions. Your interest would be fully protected in work of this nature if the general contractor were required to furnish a bond protecting sub-contractors, as, for instance, is required on all municipal work in the city of Philadelphia, and owners and architects would be saved much annoyance and duplication of duties, clerical and supervisory.

THE SITUATION WITH REFERENCE TO THE "STANDARD DOCUMENTS."

The matter of improving the relations between architects and those entrusted with the execution of their work by no means ceased to engage the attention of architects with the discontinuance of the institute's conference committee. Work was still under way by another and larger committee of the Institute of Architects to bring about better conditions in all estimating and contractural relations in which architects, owners, contractors and others are vitally concerned.

I refer to the committee on contracts and specifications, which finally concluded its most arduous labors little more than a year ago, when, after serious and countless conferences with representatives of the National Association of Builders', exchanges and many other interested bodies, the second edition of the

"Standard Documents of the Institute" was issued.

These embrace four papers: "Form of Agreement and General Conditions of the Contract," "Bond of Suretyship," "Form of Sub-Contract," "Letter of Acceptance of Sub-Contractor's Proposal." They cover as fully as is possible the points formerly raised as to the relations of the architect to all parties in interest and the relations of these parties one to the other, including all contractors, sub-contractors and the owner.

Desiring to fortify my position on this occasion with the views of other architects, I wrote several of my friends in different cities, asking for suggestions.

Among the replies received was one from W. Stanley Parker, of Boston, whose great service in connection with the work of the committee to which I have just referred, to the profession of architecture, and all interests allied with it, has everywhere been recognized.

ATTITUDE OF NEW YORK CONTRACTORS TOWARD "STANDARD DOCUMENTS."

The letter has such an important bearing on our relations that I am going to read it to you, and I earnestly hope that it may result in furthering your cooperation. He said:

"Roughly, the situation is this: The men in New York who are members of the National Association are also members of the Building Trades Employers' Association in New York. The committee of the Employers' Association has not approved the documents, and some of the steam fitters in New York seem to agree with objections that the New York Employers' Association have made. The National Association of Master Steam Fitters, however, prior to this action in New York, did approve the documents. An effort has been made to get the National association to withdraw its approval, but this action has not been taken. The National association, however, did fail to approve the revised sub-contract form on account of the general situation. I have been all over the situation with one of the men in New York who, though not on the committee there, has voiced, as I understand it, the general points of opposition that they find.

"The principal objection seems to be that the documents are too long. They seem to fail to appreciate that the value of a standard document is not in its brevity, but its inclusiveness in regard to all of the most general conditions existing in a contract. They seem to feel it is a detriment to have some conditions included which rarely, if ever, occur in their particular work. The fact that the meaning of the standard clauses can be made clear by expert advice, and that they can readily learn what clauses apply to them and what do not, does not seem to appeal to them as being vastly superior to varying general conditions in which they must study, each time, the particular clauses and in regard to which they really should have expert advice of a lawyer each time.

"They also object to the liability insurance arrangement, but apparently because it costs the owner more. All we want and all we were trying to get was complete protection for the owner at the least expense. If we have not succeeded in doing this, subsequent editions will doubtless change the wording. But additional expense to the owner is no justification for refusal to approve the documents.

They alsó seem to think that the documents are available for application only to general contracts. They fail to see the intended and actual adaptability of the documents to *any* contract, and a heating contract practically always has sub-contracts involved in it, and so is in effect a general contract itself; the form, therefore, applies to their work as direct contractors, if their work is so executed. Doubtless in connection with a heating contract, or electric contract, or a plumbing contract, additional clauses would be needed, as in the case of nearly every building contract, and conceivably some clauses might be entirely crossed out. The fundamental provisions, however, apply. This they do not seem to appreciate.

"They object to what they conceive to be some statements that limit the architect in being the agent of the owner, and feel, apparently, that all provisions of the contract in which the architect is assumed definitely or by inference *not* to be the agent of the owner are objectionable. They fail to appreciate that

for the purpose of *carrying on* the contract *as agreed upon,* the architect is definitely accredited the agent of the owner for certain specific purposes, but that for purposes of *changing the contract* his agency is properly limited, as every owner would naturally insist.

"There also seems to be objection to the fact that it is possible to make changes in the Standard Form, and that changes are even anticipated. They seem to feel that if a Standard Form can be changed it loses its value as a Standard Form. This, of course, appears on the face of it, to us, to be unreasonable, since no standard form will ever be developed that will not be subject to changes to fit individual conditions. Having, however, a complete and full Standard Form, it assists the contractor to observe readily points in which changes are made, the balance of the document being familiar to him without study in each particular case."

CONTRACTORS SHOULD NOT PAY FOR BLUEPRINTS IN ESTIMATING.

I feel that it is quite right and only proper that, except in the case perhaps of advertised work, contractors should not be required to pay for blueprints for estimating purpose. Heating contractors should also retain one set for their files and records. They are doing their full share in bearing the cost of estimating, which under out present system is but a contribution to our enormous national waste and a factor in the high cost of building. It has been computed that there is spent in this country each year for the privilege of estimating the sum of over $85,000,000, more than one-half of which, on a conservative basis, could be saved if efficient methods along the lines of the so-termed "quantity survey system" were generally adopted.

Instead of hopefully waiting for proper methods of estimating to be evolved, let us do our share now in improving them in every way possible. Architects can help greatly in conserving waste of money and human energy in the heating field alone if they will do some very simple things, which I suggest that you can call upon them to do. Some of these *are* now being done by those architects whose first thought is real service to their employers—the clients. One of these is the preparation of clear and complete drawings and precise specifications which lessen the time and risks contractors take in estimating and which convey to them the assurance that they will not, if they secure the contract, be expected to make up for shortcomings of the architect.

I have seen some architects' drawings without figures outside or inside of the plans, and have read some specifications almost as brief as this: "Heat all portions of the building to 70° in zero weather and guarantee these results." Here we have steam-fitters, say twenty to thirty, if under the sub-contractor evil, spending their time scaling off every office or room or enclosed area, when all this time could be saved if one draftsman in an architect's office had taken the time necessary to do this work once,—and properly.

In that large number of every-day cases where no consulting engineer is employed, and where you are expected to do your own calculating and engineering, and assume all responsibility for results, —only to be beaten out, if you have figured even conservatively, by some one not so scrupulous, intelligent or careful,— why not refuse to estimate until you are furnished with a reasonable amount of data upon which to base your estimate?

I would urge you, individually and collectively, assuming that you are willing to estimate under these conditions, to insist upon certain basic requirements as a precedent to estimating. Architects can help you greatly if they will become accustomed to putting on every plan both dimensions of each enclosed space,—perhaps even to computing either the area or the cubical contents of each enclosure,— moreover the addition of figures to indicate the area of window and outside door openings would in many cases save much time and handling of prints to refer back and forth from plans to elevations and sections. Can you not take this up and perhaps consider symbols for drawings?

And in the matter of incomplete and indefinite specifications or of those equally as bad, imposing conditions or guarantees impossible to provide,—even if they have been prepared merely in accordance with the routine of an antiquated custom,—why not return them to the archi-

tect or the engineer responsible for them and frankly state your reasons for not estimating? Be courageous and do this for the good of the cause!

Obviously the architect who makes every heating contractor perform gratuitous calculating and engineering saves himself time, labor and cost, and transfers these not to one but to a large number of heating contractors—and, eventually, to the owners.

And yet one of the singular factors in this condition of affairs is that the trouble often begins with the owners, who too often do not select their architects on the basis of competency and integrity. After allowing for the younger and inexperienced men who are selected on the basis of friendship or otherwise and should be given every practical assistance possible by associations of their fellows and of others in the crafts the facts are that many architects who render full and proper services are the ones who charge a greater fee than those who do not, or rather, I should say, those who do *not* render or do not *expect* to render the nicer and fairer and, in the end, the more economical service, do not charge the owner as much as those architects who do. Unfortunately some owners give too much consideration to the question of fee in selecting their architects and do not always discriminate between the kinds of service, where the recollection of the quality will remain long after the fee is forgotten. You heating men have the same thing to contend with, so you know all about it, but the owners do not discover their mistake until it is too late.

Of course, for all work of any size, for power plants, and mechanical equipment and for work of a specialized nature, it is to be presumed that the services of a competent engineer have been engaged and the drawings and specifications prepared with accuracy and precision. Presumably such a man will be a member of The American Society of Heating and Ventilating Engineers. If not, he ought to be.

VALUE OF HIGH-GRADE MEMBERSHIP FOR REFERENCE PURPOSES.

In passing I wish to lay stress on this matter of membership, for it applies to your own association as well. All the good men in your calling should invariably be included in your membership. Only such should be properly qualified to enjoy the privileges of your association. Then it will be pertinent on the part of architects and owners considering the awarding of a contract to inquire if the contractor about to be chosen is a member of the association, and if not, why not? Not being a member should be attributed either to a lack of eligibility or to a lack of sensitiveness to his responsibilities, for all good men should delight in assisting organizations of their fellow craftsmen, not for what good the association may do them, but for what good they may do the association.

Your association through its members and committees has already done much to simplify heating practice. This ought greatly to be appreciated by the trade in general, especially by the younger men, who have thus benefited by the results of your experience. You have in this way, also, rendered an assistance to architects and performed services to the owners and occupants of buildings perhaps unbeknown to them.

In addition to what you have done in perfecting certain practices in piping, and in standardizing flanges, couplings, and threads, etc., can you not further cooperate with The American Society of Heating and Ventilating Engineers and with the American Society of Mechanical Engineers and manufacturers of apparatus, in developing a standard or uniform basis of rating for boilers and domestic water heating apparatus, etc.? I know you have been working on this, or I have read of it in your 1914 proceedings, but can we not look for a definite pronouncement and the publishing of the results?

UNIFORM RADIATION FORMULA RECOMMENDED.

Can you not in co-operation with the same society work on developing a basic formula or officially approving one of those in existence for computing the amount of radiation recommended in proportion to cubical contents, to outside wall area (for different kinds of wells) and different exposures, to window and door openings, etc., and make this available to all architects for instant reference?

Such a formula, if not actually used, as it should be, by those architects who do not employ an engineer for some of their everyday problems, could at least be referred to in their specifications. Then, instead of calling for the building to be heated according to the varying individual judgment of each contractor estimating, these architects could refer to such a formula, as providing the minimum installation allowed. This would undoubtedly be a great improvement over the indefinite methods now obtaining and would provide equable conditions of estimating so far as capacity of apparatus and amount of radiation is concerned. If any estimate received appeared either too low in cost or deficient in quantities, such a formula would afford any architect an opportunity to check up for comparison with other estimates.

Of course, preferably, it should be used as the basis of his own calculations to be definitely stated before estimates are asked, and, if so used, I cannot see how it would interfere with the occupation of heating engineers, which is one of the arguments that might be advanced against it. Presumably it would only be used by those architects who would not in any case have employed an engineer for that particular work.

This is a suggestion which I wish you seriously to consider, for I believe it would greatly facilitate common practice in steam fitting, just as the piping of buildings for gas will be facilitated by the basic piping schedule recently adopted by the National Commercial Gas Association.

Of course this basic formula would not alone be sufficient to insure absolute equality of conditions in estimating. There are other matters to be considered, such as a general description or outline specifications or requirements for the ordinary run of work, which, it seems to me, could well be drawn up by your association. This would, of course, not apply to sizes of pipes, which in your case I appreciate are variable, but should be in the form of suggestions to architects as a basis for their specifications to provide truly competitive conditions of estimating, as to whether pipes are to be exposed or to be encased in walls or partitions, as to chasing and covering of same, as to valving and draining raisers in hot water installations, the height of radiators, whether under sills, or seats or not, and so forth, in simple work and on up into air lines, returns and other important principles in larger work.

And then there is the matter of sectional covering and banding on lateral runs, plastic covering on flanges, couplings and fittings, and on the heating apparatus itself,—surely some standards of practice could be developed which would greatly aid in establishing a uniform basis of estimating.

USE OF NAMES AND BRANDS IN SPECIFICATIONS FAVORED.

While we are speaking on the subject of clarity, why not let us co-operate to get rid of words in specifications which say, but do not mean, "very best quality" and the "or equal," in favor of calling for the brands, thickness and weight of pipes and for the various other products by the several names which will be acceptable?

More and more frequently a distinction is being made as to quality in materials of building construction and stronger encouragement is being given to those producers who, in spite of rigid competition, adhere to their standards of manufacture and make names for themselves under established brands.

Accounting Under Municipal and Private Ownership.

The discussion of the advantages of municipally-owned public utilities, such as central station heating plants, includes the following adverse argument which is going the rounds of the daily papers:

Let every man who is tempted to accept the argument of government-ownership advocates remember this: When the government computes its expenses of operation it omits many items of actual expense, particularly of the character of what may be called "overhead charges." For instance, in our postal service, the Post Office Department does not charge itself with the rental value of public buildings it occupies, nor with the expense of lighting, heating and up-keep of such buildings. A department having charge of any public service naturally desires to make a good showing in its annual statements, so many of these items are not definitely and specifically included in the expense accounts. A private concern cannot run a business on any such plan, and neither should the government.

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IN a carefully-planned effort to increase the value of engineering meetings to those in attendance, new methods are coming into use which are gradually changing the character of these gatherings. They are becoming more sociable without, however, sacrificing their professional character. It goes without saying that an engineering convention should be so conducted that every valuable item of information contained in the papers or discussions should be brought to the notice of those interested. Yet it is often the case that a general discussion will fail to bring out the vital points, sometimes because of lack of time due to a diverting discussion of other points, but more often because of diffidence or disinclination on the part of the men having the desired data. It has been found, for instance, that less than 10% of the men in attendance at a convention take part in the discussions, while the outside attractions during the sessions themselves are apt to curtail the attendance, in reality raising this percentage appreciably.

The time-honored method of conducting a technical meeting consists, briefly, in the reading of papers and reports, followed in each case, by general discussion. This, perhaps, will always be necessary, but the modern tendency is to vary such sessions with scheduled attractions, usually of a semi-engineering nature, so arranged as to insure a maximum attendance, and, at the same time, afford an opportunity for sociability and personal talks that is wholly lacking in the more formal sessions.

A TYPICAL instance of this feature was carried out at the recent meeting of the heating engineers in Detroit. A whole day was given over to a trip to the University of Michigan, the programme calling for two engineering sessions at the university, in addition to inspection trips and entertainment features. In the first place, practically every member of the convention was present and kept with the party throughout the day. Then, on the way down and back and during the tour of inspection opportunities arose for personal chats every time the party shifted. Incidentally, in this particular case, the reading and discussion of two of the papers, containing reports of tests, were made especially interesting in coming directly after an inspection of the testing apparatus itself, which was in operation at the time at the university.

It is difficult to think of a more effective method of interesting a convention body and at the same time carrying out the purpose of the meeting. In fact, with so many technical papers printed not only in advance, but often in magazine form, it may be doubted whether they will continue to be presented at engineering meetings by more than title and perhaps a brief synopsis, leaving most of the time open for what might be termed "engineering diversions."

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

Mid-Summer Meeting, Detroit, Mich., July 19-21, 1916

New ideas in conducting an engineering convention were carried out with marked success at the semi-annual meeting of the American Society of Heating and Ventilating Engineers, which was held in Detroit, Mich., July 19-21, 1916.

The recently - organized Michigan Chapter, which was the host on this occasion, lived up to its enviable reputation as one of the liveliest chapters in the society. After laying out an ambitious programme for the meeting itself and in the way of entertainment features, the chapter proceeded to carry it through with a degree of enthusiasm and "pep" that made every moment of the meeting interesting and enjoyable. It was easily the society's most successful summer meeting.

HARRY M. HART.
President of the American Society of Heating and Ventilating Engineers.

In the first place, an entire day was given up to a visit to the University of Michigan, the convention party being taken the 40 miles to Ann Arbor and back in special automobiles. Here the programme called for two engineering sessions, in addition to an inspection of the university's testing equipment and power plant, and a luncheon and organ recital thrown in.

This visit and session were the novel features of the meeting. They were carried out practically on schedule time and afforded an opportunity for sociability and good-fellowship that assured their success long before the day was over.

Before the meeting came to an end a rising vote of thanks was given to Professor John R. Allen, of the university, for the courtesies extended the society at Ann Arbor and this was followed on the closing day of the meeting, by an equally hearty vote of thanks to the Michigan Chapter for the delightful hospitality it had displayed.

Always a charming convention city, Detroit did its best throughout the convention, although the weather left no doubts in anyone's mind that it was summer time and July. The boat ride, which came on the second night, was taken under ideal conditions.

Morning Session, July 19.

President Harry M. Hart called the meeting to order in the assembly room of the Hotel Statler. He introduced Mr. Lee of the corporation counsel's office, who extended a welcome on behalf of Mayor Marx. He paid a tribute to

Secretary William F. McDonald of the Michigan Chapter, who has been appointed a member of the local building commission by Mayor Marx. This commission is revising the building code of Detroit, including not only the heating and ventilating, but construction features as well.

President Hart responded to the Mayor's welcome. He urged the extension of local chapters, declaring that the society should have at least ten or fifteen such chapters, instead of five as at present. He also suggested the appointment of "local secretaries" to represent the society in cities where no local chapters exist, with the idea of developing a chapter sentiment in such localities.

President Hart said that he looked forward to the time when the Journal of the society would become a monthly publication and he paid a tribute to the society's publication committee for the Journal's fine appearance. Regarding the advertising policy of the Journal, President Hart declared it as his opinion that the society should not attempt to make money through the Journal's advertising patronage, but that the income should be sufficient to pay the expense of publication.

ADDRESS BY WILLIAM J. BALDWIN.

Before proceeding to the regular business the chair announced that one of the honorary members of the society, William J. Baldwin, of New York, was present, and he called on Mr. Baldwin to address the meeting.

Mr. Baldwin told the convention that his first errand on arriving in Detroit was to visit the Moffat Building, which, he stated, was the second building in Detroit to be equipped with a steam heating and power plant. This plant was installed under his direction. The original elevators are still in use, although the passenger elevators are now driven by hydraulic power in place of the original Otis steam engines.

Mr. Baldwin said he was bewildered by the changes that had taken place in Detroit since his last visit to the city some thirty years since.

After his work in installing the Moffat Building plant, Mr. Baldwin remained in Detroit for several years as superintendent of the Detroit Novelty works. In Detroit, he said, was manufactured the first cast-iron hot water radiator. It was made with rubber grummets, connecting the upper part of the sections. The lower parts were of "screw nipple" construction. This unit was known as the Detroit radiator and was the pioneer product of the American Radiator Co. J. B. Dyer of Detroit, was the inceptor of this type, which, in general appearance is similar to that in general use today.

CHAPTER REPORTS.

Chapter reports were then presented from the Illinois, Michigan, New York, Ohio and Eastern Pennsylvania chapters, detailing their activities during the past year.

REPORT ON ENGINEERING CO-OPERATION.

A special report was presented by John F. Hale, who was the society's representative on the conference on engineering co-operation held by the various engineering bodies in Chicago last winter. This report was published in THE HEATING AND VENTILATING MAGAZINE for May and June.

The idea of the conference was to promote co-operation among engineers throughout the country to improve their status. A sub-committee was appointed to work up the ideas presented at the conference, to be acted on at a later meeting. Mr. Hale stated that it was possible a new organization would be formed with its membership drawn from all the engineering societies in the United States. He urged the society's continued interest in the project. It was voted to refer the matter to the council of the society, urging its favorable consideration.

An important paper was then presented by the Committee on the Best Position for a Radiator in a Room, W. F. Verner, chairman. The report brought out the interesting point that the best position of a radiator, from the standpoint of efficiency, is in the center of the room. That is, in this location more B.T.U. are secured per square foot per degree difference between the steam in the radiator and the average temperature of the room than when the radiator is in any other position.

HEATING AND VENTILATING ENGINEERS AT DETROIT MEETING, JULY 19-21, 1916.

Mr. Baldwin said that whether or not a radiator away from the outside wall showed greater efficiency, the fact remained that a radiator under the windows was necessary to counteract the movement of cold air across the floor.

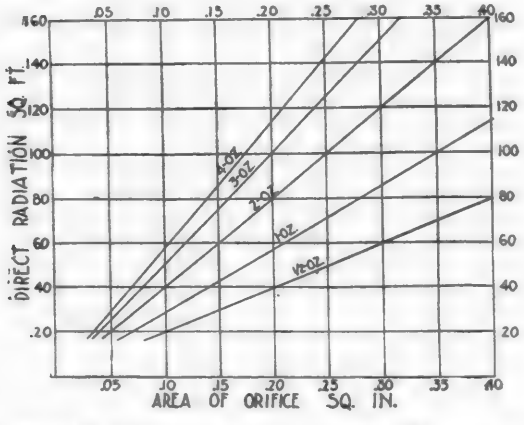
Mr. Donnelly said it was necessary to define what is meant by "best position," because the efficiency of a radiator and the maintenance of comfortable room temperatures were two different propositions, and while a location away from the window might give better efficiency it would not necessarily result in more uniform or more comfortable room temperatures.

John F. Hale stated that as he understood the report it was the purpose of the committee to show what could be done in case of necessity due to the location of furniture, etc.

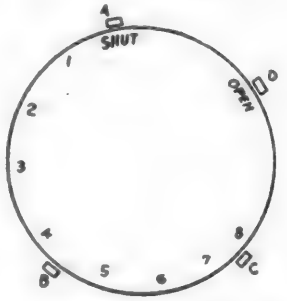
At the close of the discussion the convention photograph was taken near the main entrance of the hotel.

Afternoon Session, July 19.

The first professional paper of the meeting was presented at the opening of the afternoon session, being a discussion of "Design and Operation of Tractional Valves," by James A. Donnelly. This paper included a chart showing the area of orifices necessary in fractional valves to supply varying amounts of radiation, with differences in pressure from ½ oz. to 4 oz. The paper also gave a suggested new arrangement of dial, designed for use under different conditions: (1) For the normal heating of the smallest radiator for which the valve is rated; (2) For the normal heating of the largest radiator; (3) For the quick heating of a radiator. The dial was also arranged so that it would fractionally control the smaller radiator as well as the larger radiator.



AREAS OF ORIFICE NECESSARY WITH DIFFERENT PRESSURE DROPS.



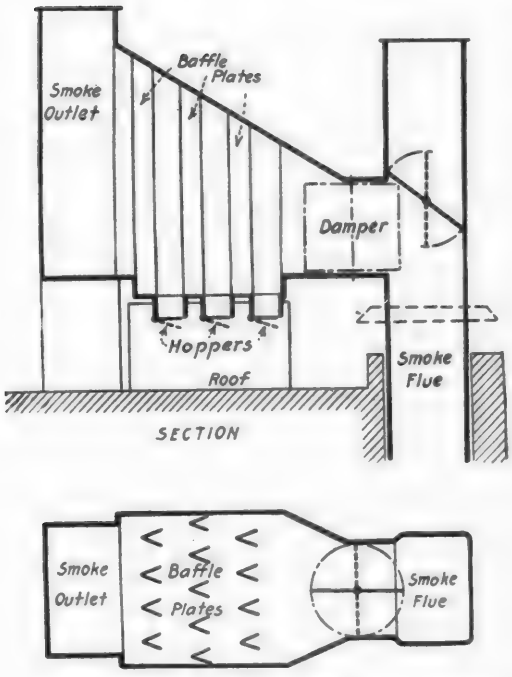
SUGGESTED ARRANGEMENT OF DIAL FOR FRACTIONAL VALVES.

Mr. Hale brought up the point that where fractional valves are designed, for instance, to take care of from 21 to 40 sq. ft. of radiation on a ¾-in. connection, as was mentioned in the paper, it was evident that the control would not be equally satisfactory on say, a 22-sq. ft. radiator and on a 40-sq. ft. radiator. This, he said, showed that some additional control is necessary.

In closing the discussion Mr. Donnelly said he hoped the subject would receive further attention on the part of the society because, judging from the wide variance in the opening of both inlet and outlet valves, the present practice was in a "chaotic" condition.

A paper on "Clean, Pure Air for Our Cities," by a member, was read by Secretary Obert. The paper described the construction and operation of a cinder collector erected on the top of the chimney of a power plant in New York. It consists mainly of a large settling chamber filled with a set of baffles so arranged as to extract the maximum amount of cinders without creating an undue resistence to the flow of gases. The cinders are removed once a week from the hoppers below the settling chamber by means of cleaning doors at the bottom. Ordinarily about 5 cu. ft. of cinders are removed weekly from the collector.

Mr. Baldwin exhibited a dust removal machine of his own design (illustrated in THE HEATING AND VENTILATING MAGAZINE for July, 1916).



CONSTRUCTION OF CINDER COLLECTOR.

A paper by L. P. Dwyer on "Commercial Drying Apparatus," was read by Secretary Obert. The room type apparatus was described, as well as the spray process of milk drying. The author also took up types of progressive apparatus, in which use is made of a conveying belt or screen.

The process of drying garbage was described, using a revolving drum or cylinder.

Mr. F. R. Still said there was a wide field for the heating and ventilating engineer in drying work, especially in foreign countries, and that the principles were little understood in engineering circles.

A telegram of greeting was read from Reginald Pelham Bolton of New York, regretting his inability to be present.

A paper on "Heat Transmission Calculations" by a member, was read by Secretary Obert. Twenty-five engineers were invited to figure the required heating surface for a given suite of rooms. Seven responses were received and the varying amounts given were most remarkable. For the main office the surface ranged from 95 to 216 sq. ft.; for the skylight, from 18 to 112 sq ft.; for the private office, from 32 to 117 sq. ft.; and for the toilet, from 15 to 26 sq. ft. Moreover, the high figures were not all from the same engineer.

The paper expressed the hope that the society's committee on standards will start at the bottom and publish what may be considered good standards for determining these elementary matters.

A paper was presented by Secretary C. W. Obert on "Ventilation of Garages." The danger of asphyxiation, especially in small garages, when the motor is running, led to the suggestion that flexible tubing be run from the muffler to the outside. The author also described the methods in use in larger garages and motor shops, the illustrations including several typical installations, including forms of exhaust flues suitable for garage ventilation. The usual arrangement, it was shown, is a series of muffler tubings, one for each car, connected to a main pipe. This, in turn, leads to an exhaust fan, running thence in some cases directly outdoors and in others, to the chimney flue.

Ann Arbor Session, July 20.

Prof. John R. Allen of the University of Michigan presented the principal paper at this session, which was held in the Engineering Building of the university in Ann Arbor. This paper, which was entitled "Heat Transmission Through Building Materials," gave the results of some unusual tests on heat losses through glass. The principal new feature of this test was the equipment of the testing box which made it possible to get the effects of wind and rain. The box was mounted on trunnions so that the exposed glass could be placed as a window, ceiling, skylight or floor.

The principal fact brought out was that the effect of wind and rain raised the usual coefficient of 1 to 1.485, or practically 50 per cent. more than that used at present.

This, explained Professor Allen, may account for the allowance often made above the calculated requirements, especially in greenhouse work.

M. W. Franklin said it would be interesting to know whether a law could be evolved for the diffusion of heat through building material of different thicknesses, very much as is now done in connection with metals.

Prof. Allen said that further tests on cement and other materials might make it possible to develop such a law.

Regarding the radiant and conduction heat losses, Prof. Allen stated that he never could separate radiant from conducted heat.

The effect of humidity inside of the box was not determined, and Prof. Allen stated that he would take this into consideration, as it might have an appreciable effect. The temperature of the water before and after striking the window also was not taken and, of course, some heat would be absorbed in this way.

He stated that he believed the coefficient was not absolutely a constant and that it would be a bit higher for great differences between inside and outside temperatures. Not sufficient data have yet been obtained to plot a curve for this.

RELATIVE HEATING VALUES OF COPPER AND IRON COILS.

A remark by Mr. Baldwin that there was no appreciable difference in the efficiency of copper and wrought-iron coils in a hot water tank brought out considerable discussion, the consensus of opinion being to the same effect and that the supposed superiority of copper coils was due to its known higher conductivity. The determining factor, however, it was brought out, is the substance being heated and the rapidity with which it passed over the heating surfaces.

R. W. Davenport read a paper on "Notes on Testing of Warm Air Furnaces." The author first spoke of the difficulties in determining the characteristics of a warm-air furnace, which, he said, are seemingly out of all proportion to the simplicity of the furnace itself. He then recounted some of these difficulties, principal among which were the matter of firing, and the determination of the velocity of the warm air.

The results showed that there is a profound influence on the efficiency exerted by the rate of combustion, this efficiency running from 78 per cent. of the B.T.U. content of the coal delivered to the air when burning 15 lbs. of coal per hour, to 86 per cent. when burning 10 lbs. of coal per hour. It was evident, therefore, that for every size of furnace the preferential combustion rates may be defined within narrow limits.

The author advocated the "balanced" method of firing which was used in this test, as it practically insures that any change of observed values is due to the change in the arrangement of the apparatus and not to the change in the rate of combustion through the burning down of the fuel bed.

The discussion brought out the point that while this method of firing is not commercially practicable, it is especially useful in getting accurate test results.

A message of greeting was read from Theodore Weinshank of Indianapolis, who advised that southern floods had prevented him from being present.

The session then adjourned to the Women's Gymnasium building, where luncheon was served.

After luncheon the party was taken to the Hill Auditorium. Here an organ recital was given by Mr. Earl Moore, of the University School of Music. This proved a most delightful entertainment, Mr. Moore's programme being carefully varied.

After the recital an inspection was made of the heating and ventilating equipment of the Auditorium. The party was first shown one of the air intakes and passed along the air corridor to the heaters and fans, which were in operation, delivering air to an unusually large plenum chamber occupying the entire space underneath the auditorium. Air passed into the auditorium through mushroom ventilators under every seat. Exhaust fans at the roof removed the used air through registers in the balcony ceilings. Provisions are made for recirculating the air in warming up the building.

The power house of the university was also visited, and many expressions were heard as to the high type of apparatus installed and the good workmanship shown in the installation. The plant was designed by a member of the society, R. C. Collamore, of Detroit.

In spite of the heat, both indoors and out, many brave spirits were found to be willing and anxious to take the trip through the heating tunnels leading from the power house to the various buildings on the campus. This tunnel is 1,600 ft. long with a temperature in it of 120 deg.,

and before the end was reached, most of the party were ready to take affidavit that the figures as to temperature, at least should be 1,600.

On emerging from the tunnel the contrast made the outdoor air seem positively chilly by comparison and coats were quickly donned to equalize matters.

The party then proceeded to the Engineering Building where the final paper of the day was read by Prof. J. E. Emswiler, of the University of Michigan, on "Coefficient of Friction of Air Flowing in Round, Galvanized Iron Ducts." This paper, like Prof. Allen's, described recent tests made at the university, the testing apparatus itself being on view on a lower floor.

Morning Session, July 21.

An exhaustive presentation of "Engineering and Cost Data Relative to the Installation of Steam Distributing Systems in a Large City," by F. H. Valentine, was given at the Friday morning session. This paper took up such questions as location, cost and general design of underground steam mains. The latter portion discussed methods of insulation and some interesting data on opening up and replacing pavements, with comparisons of similar data presented at the last annual meeting by Prof. W. F. Verner. For similar classes of pavement, the comparative costs ran remarkably close.

A paper by Prof. J. D. Hoffman was presented on "Heating a Conservatory and Green House." Prof. Hoffman supplemented his description of the installation (which involved the extension of an older plant and provisions for future extensions) with a complete analysis of the new installation. The heating plant in this case was hot water, open tank type, with the radiators and coils all connected on the downward-flow principle; that is, all the hot water from the heater is directed to the highest point of the circulating system, and then subdivided to the various coils and radiators on the return flow.

The final paper was on the "Effect of A. S. M. E. Boiler Code on Heating Boilers," by C. W. Obert. Mr. Obert is the secretary of the Boiler Code Committee of the American Society of Mechanical Engineers as well as of the heating engineers' society. The discussion of this report brought out the information from Mr. Obert that the Boiler Code Committee was still holding monthly meetings to consider suggestions and answer questions regarding the code and to make rulings concerning its interpretation.

The meeting then adjourned.

The Entertainment.

Under the direction of the members of the Michigan Chapter, headed by President John R. Allen and Secretary William F. McDonald, every spare moment of the meeting was filled with entertainment features. These were not only delightful in themselves, but were carried out with a degree of promptness and dash that kept everyone in high spirits.

First on the programme was a convention luncheon on the opening day of the meeting, served in a room adjoining the convention hall. At the same time a luncheon was served to the ladies at the Fellowcraft Club.

That evening the entire party went over to the Fellowcraft Club for a dinner dance.

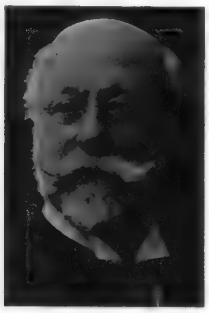
OFFICERS OF THE MICHIGAN CHAPTER PREPARING FOR THE DETROIT CONVENTION.

The clubrooms were admirably suited for the purpose and, being on an upper floor, caught the slight breezes that were most welcome in view of the heat.

Professor John R. Allen of the University of Michigan, who is also president of the Michigan Chapter, acted as toastmaster and called upon A. G. Pittelkow as the first speaker. Mr. Pittelkow was followed by President Harry M. Hart of the society, who expressed his admiration for the interest and enthusiasm displayed by the new baby, the Michigan Chapter, and said he was only voicing the sentiments of all present when he stated that the meeting was proving the most successful of the society's many mid-summer meetings.

William J. Baldwin, an honorary member of the society, was then called on for a few words. Mr. Baldwin was attending his

first summer meeting of this society and he declared his satisfaction in the programme itself as well as in the many delightful courtesies that had been extended to him.



WILLIAM J. BALDWIN,
Honorary Member of the Heating Engineers' Society.

He expressed his astonishment at the growth of Detroit and declared that the ladies present bore out Detroit's reputation as the home of beautiful women.

Frank K. Chew responded for the trade press. He said not the least service rendered the society by the trade press were its frank statements from time to time as to the society's needs and he predicted a bright future for both the society and the trade press.

Charles W. Locker and Secretary William F. McDonald of the Michigan Chapter were also called on and while each generously credited the other with the success of the arrangements for the meeting, the diners held each equally responsible and their applause for both speakers testified to their appreciation.

After the speechmaking, the guests passed downstairs to the dancing hall where ample room was provided for the dancers as well as for those who wished to watch the festivities.

On the second day, Thursday, the trip was made to Ann Arbor, for the most part, in special automobiles. It was a merry cavalcade that wound its way out to the pretty university city, following, for the most part, excellent concrete roads. A slight shower at Ann Arbor looked threatening for a time, but passed over. As was learned on the return trip, the shower struck a point midway between Ann Arbor and Detroit and the long rows of fallen corn testified to the intensity of the wind and rain. On reaching Detroit, however, the streets were still dry and dusty, showing that the rain had not reached the city.

Most of the automobiles got back to the Statler in time for a six o'clock dinner, although a series of accidents premeditated and otherwise, to two of the cars held them up for some time. It is a terrible thing to find yourself on the road with an exhausted gasoline supply, but it is far more terri-

LADIES PRESENT AT THE DETROIT MEETING OF THE HEATING ENGINEERS.

ble to face such a victim when you are responsible for his shortage. Then, to add insult to injury by fetching a pint supply of the much-needed fluid is almost too much for words. In the interest of truth, it is necessary to state that all of these things happened, although the bold perpetrator of the joke suffered a real calamity when nearing Detroit by having a motor truck muss up his car. Fortunately no one was injured.

Several of Detroit's prominent heating engineers were among those who offered their cars for the Ann Arbor trip, one of the merriest parties being that in Mr. A. G. Pittelkow's car.

In the evening the party repaired to the Woodward Street wharf where the steamboat "Pleasure" was in readiness for the moonlight boat ride and dance. While the boat cruised up and down the Detroit River, dancing was generally indulged in, and downstairs a buffet supper was served. The night was perfect for a river ride and the presence of an unusually large number of ladies added immensely to the success of the occasion.

Friday afternoon, after the meeting was over, parties were taken to the Ford automobile plant and to the plant of the United States Radiator Corporation, where some interesting boiler performance tests were being conducted.

Another party wended its way to the links of the Detroit Golf Club and proceeded to stage a weird and wonderful foursome, with the East pitted against the West. The East won on the home hole with a winning put, variously described as from 10 to 30 yards in length.

The Michigan Chapter members who were actively on duty included President John R. Allen, Frank G. Phegley, Secretary William F. McDonald, J. Deegan and C. M. McSorley.

The Outside Convention.

One of the "life-savers" on the opening day of the meeting was the bunch of palm-leaf fans which were distributed at the critical moment just before the opening session, when the heat was getting in its best licks.

Needless to say, it was a coatless convention. After the fans had gotten in their good work, the delegates were ready to enjoy the celluloid-wrapped Havanas, which were distributed at frequent intervals, bearing the inscription, "Compliments of the Michigan Chapter, A. S. H. & V. E., Summer Meeting."

The announcement that Detroit is revising its building code aroused much interest, especially as Mayor Marx has appointed William F. McDonald a member of the building commission which will do the revision work.

Among the absentees who sent regrets were Reginald Pelham Bolton, of New York; Theodore Weinshank, of Indianapolis, and James H. Davis, of Chicago. Mr. Davis was detained by illness and many expressed their interest and hopes for his speedy recovery of health.

THOSE PRESENT.

A. Benbrook, E. F. Capron, E. J. Claffey, J. A. Cutler, C. A. Dunham, Robert L. Gifford, W. B. Graves, John F. Hale, E. L. Hogan, H. M. Hart, R. H. Lindman, E. A. May, C. F. Newport, B. Nelson, E. W. Sanborn, L. C. Soule, J. F. Tuttle, W. S. Hillis, T. Wilson, O. T. Carson and W. H. Burquest, of Chicago.

James R. Bolton, F. K. Boomhower, T. E. Coon, R. Collamore, R. F. Connell, J. E. Deegan, E. L. Downs, R. W. Davenport, Wm. M. Foster, E. M. Harrigan, H. M. Hamlin, N. J. Hill, F. W. Johnson, J. L. Fuller, A. B. Knight, Charles W. Locker, E. J. Lomasney, E. R. Little, J. R. McColl, C. M. McSorley, E. E. McNair, C. J. Peck, G. C. Polk, A. G. Pittelkow, D. H. Petherick, J. H. Walker, C. W. Wheeler, R. S. M. Wilde, F. R. Woolley, L. A. Whitcomb, H. L. Walton, Wm. F. McDonald, N. W. Calvert, T. M. Carrabin, R. T. Craig, F. F. Craig, T. Chester, R. B. Deen, C. W. Farrer, F. B. Fitzgerald, A. P. Gow, T. D. Hayes, N. A. Henwood, Wm. T. Harms, H. H. Hughson, E. Judson, B. E. LaFollette, John C. McCabe, F. J. Singer, R. G. Smith, E. Snell, H. C. Van Sickle, J. B. Webb, H. V. Pearce, G. K. Saurwein, J. H. Trombley and H. B. Lord, of Detroit.

W. J. Baldwin, A. S. Armagnac, J. J. Blackmore, Frank T. Chapman, F. K. Chew, J. A. Donnelly, E. F. Glore, C. W. Obert, Henry D. Bristol, A. H. Ross and George Wood, of New York.

M. L. Cromwell, C. Gottwald, R. J. Mayer, R. S. Mayer, Frank G. Phegley, E. A. Stark, F. H. Valentine, W. Van Sickle, C. F. Beckwith, J. W. Farleye and T. F. Haynes, of Cleveland, O.

Prof. John R. Allen, Prof. J. E. Emswiler and F. Hutzel, of Ann Arbor, Mich.

Charles A. Blaney, Kalamazoo, Mich.

J. F. Firestone, Dowagiac, Mich.

J. D. Cassell, W. J. Robinson and C. P. Hackett, Philadelphia, Pa.

R. R. Jones, Harrisburg, Pa.

M. W. Franklin, East Orange, N. J.

W. J. Braemer and E. K. Lanning, Camden, N. J.

W. G. Brown, Highland Park, Mich.

A. G. Cripps, Akron, O.

H. W. Ellis, F. R. Ellis and L. J. Mueller, Jr., Milwaukee, Wis.

L. L. Byson and P. V. Rozier, Omaha, Neb.

E. C. Lillie, Denver, Colo.

R. W. Noland, Lafayette, Ind.

R. K. Milward, St. Louis, Mo.

J. B. Wigman, Bloomington, Ill.

J. T. McElfatrick, Buffalo, N. Y.

R. J. DeLand, Toledo, O.

J. A. Gurney, Pittsburgh, Pa.

W. H. Thayer, Boston, Mass.

H. N. Booth, Kansas City, Mo.

A. H. Joliffe, Minneapolis, Minn.

L. J. Mueller, Jr., Milwaukee, Wis.

E. E. Hersh, Allentown, Pa.

C. A. Rogers, Toledo, O.

Later arrivals—A. S. Lindeblad, Chicago; E. E. Harris, Detroit; John J. Woolfenden, Detroit; W. R. Stockwell, Irvington, N. Y.; J. W. Williams, Ithaca, N. Y.; R. J. De Land, Toledo, O.; J. B. Dill Detroit; S. W. Howard, Toronto, Ont.; A. H. Jolliffe, Minneapolis, Minn.; C. H. Slaughter, Pittsburgh, Pa.; William C. Skinner, Toronto, Ont.; C. B. Veal, Lafayette, Ind.; Edward H. Vitalius, Detroit and G. D. Wilcox, Detroit.

New Members.

The following new members have been recently elected to the American Society of Heating and Ventilating Engineers:

REGULAR.

Charles R. Ammerman, Detroit, Mich.
Albert L. Baum, New York City.
William S. Blessed, Highland Park, Mich.
James R. Bolton, Detroit, Mich.
F. K. Boomhower, Detroit, Mich.
Warren G. Brown, Highland Park, Mich.
William H. Cadwell, New Britain, Conn.
Richard F. Connell, Detroit, Mich.
T. E. Coon, Detroit, Mich.
Joseph A. Cutler, Chicago, Ill.
Edwin Davenport, Elmira, N. Y.
Ransom W. Davenport, Detroit, Mich.
Edwin L. Downs, Detroit, Mich.
William G. Fraser, Syracuse, N. Y.
John Galbraith, Kelowna, B. C.
Ronald Grierson, London, England.
Daniel C. Halliday, Winnipeg, Man.
H. Archibald Harris, Chicago, Ill.
John E. Henry, Louisville, Ky.
Edgar E. Hersh, Allentown, Pa.
George D. Higgins, Detroit, Mich.
Newell J. Hill, Highland Park, Mich.
Geo. A. Houpt, Philadelphia, Pa.
David S. Jacobus, New York City.
Fred W. Johnson, Detroit., Mich.
Alfred S. Kellogg, Waverly, Mass.
James C. Kenney, Detroit, Mich.
Harry O. Koch, Richmond, Va.
Alfred M. Lane, St. Louis, Mo.
Charles W. Locker, Detroit, Mich.
Edward J. Lomasney, Detroit, Mich.
J. R. McColl, Detroit, Mich.
James H. Marks, Ann Arbor, Mich.
Edgar O. Marty, Detroit, Mich.
Orval H. Matthews, Dayton, O.
Albert S. Mattison, Detroit, Mich.
Konrad Meier, Winterthur, Switzerland.
John F. Miller, Detroit, Mich.
John A. Miller, Cleveland, O.
Francis H. Moran, Staunton, Va.
C. W. Obert, Brooklyn, N. Y.
Presley M. O'Connell, Chicago, Ill.
James W. Partlan, Detroit, Mich.
Gilbert C. Polk, Detroit, Mich.
Claude V. Saunders, Grand Rapids, Mich.
John A. Stevens, Lowell, Mass.
Edwin S. Storm, New York City.
Carleton F. Tweed, South Minneapolis, Minn.
James H. Walker, Detroit, Mich.
Hiram L. Walton, Detroit, Mich.
Harry S. Wheeler, Elizabeth, N. J.
Charles W. Wheeler, Detroit, Mich.
LeRoy A. Whitcomb, Detroit, Mich.
Raymond S. Wilde, Detroit, Mich.
Ralph E. Yeoman, Painesville, O.
Edwin R. Little, Detroit, Mich.

ASSOCIATE.

Albert Bembrook, Chicago, Ill.
Frank J. Briggs, Cincinnati, Ill.
Charles G. Burritt, Indianapolis, Ind.
Edward W. Case, Buffalo, N. Y.
John M. Chase, Syracuse, N. Y.
James E. Degan, Detroit, Mich.
J. Lansing Fuller, Detroit, Mich.
Evins F. Glore, New York City.
C. Gottwald, Cleveland, O.
Harry A. Hamlin, Detroit, Mich.
William B. Johnston, Detroit, Mich.
Alvin B. Knight, Detroit, Mich.
John J. Liner, Philadelphia, Pa.
Joseph A. Lardie, Grand Rapids, Mich.
Theodore D. Montgomery, New York City.
Gustave Petersen, New York City.
David H. Petherick, Detroit, Mich.
Ralph T. Sayles, Boston, Mass.
Arthur H. Williamson, Detroit, Mich.

JUNIOR.

George W. Bergen, Omaha, Neb.
George P. Nashman, Cleveland, O.
Peter Tazelaaar, Detroit, Mich.
Peirce M. Wood, Detroit, Mich.

THE BUSINESS OUTLOOK.

VII.

By FRANK M. HUSTON.

Financial Editor of the Chicago Evening Post; Editor Rand-McNally Bankers' Monthly.

We continue to pile up credits abroad and strengthen our financial and commercial position in a way that is most marvelous. Our commerce in the last fiscal year has exceeded all previous records by fully 40 per cent., the aggregate being estimated somewhere between $6,250,000,000 and $6,500,000,000. The total foreign trade in 1915 was approximately $4,443,000,000. The excess of exports over imports in this tremendous volume of trade last year was $1,095,000,000, in round numbers, while it is estimated that the excess for the fiscal year which closed June 30 is not far from $2,145,000,000, and it may exceed that.

In other words, since the European war began the balance of trade in our favor has increased from $470,663,000 to approximately $2,145,000,000, and adding the excess for the two fiscal years that have elapsed we find that our trade balance abroad now exceeds $3,300,000,000.

It is impossible to determine what was the invisible balance, that growing out of the international exchange of things cannot be traced as can merchandise and other commodities. In normal years when tourist travel was heavy this was estimated to be somewhere between $500,000,000 and $600,000,000. The tourist feature last year was almost entirely eliminated and the interest and dividend feature very greatly reduced through the resale of foreign-owned American securities. This necessarily keeps the interest and dividends at home, so that it is safe to say that this annual charge which is referred to so frequently as the invisible trade balance has been cut at least a half and possibly more.

Necessarily all this has a bearing on our financial and business situation and adds to our strength and ability to withstand any shock that may come out of a readjustment either during or following the war. At the present time there is some indication of a let up in our foreign trade. Munition orders are slowing down somewhat and this is manifesting itself in the disappearance of premiums for early delivery of steel and other commodities. But the future course of prices very probably will be determined for some time to come by actual developments or by evidence of known value rather than by speculative sentiment.

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THE CONSULTING ENGINEER

The Consulting Engineer" is prepared to reply, in this department, to any questions which our readers may ask regarding problems connected with the design and installation of mechanical equipments of buildings.

63—What Is the Best Type of Heating System?

QUESTION: What is the best type of heating system, hot air, hot water or steam, for any given case?

ANSWER: This question is continually presenting itself and confronts almost every person at some time in his career. The following article will attempt to point out a few general facts which may be of assistance toward making a wise selection for any given case.

The first consideration is the cost, which should be determined for the different methods in advance. Some of the methods may be eliminated at the start, due to the purpose for which the building is to be used.

As a general statement, at the present time any building may be heated by either hot air, hot water, low pressure or vapor steam, with equally good results if the apparatus is properly designed and installed. On the other hand, any of the above methods may prove unsatisfactory if improperly designed or installed. This generally occurs when the contractor tries to modify the design to meet competition.

Generally, in handling power plant and heating questions, too little consideration is given to the combined system. The heating is handled by an independent heating engineer and the power plant by a power plant expert with the result that there is often too little co-ordination and many advantages are lost. The power plant engineer wants the most economical condensing turbine which forces the heating on a live steam basis in many cases, or the condensing engines are abandoned so as to provide exhaust steam in large quantities for heating. There is no reason why the heating engineer cannot use exhaust steam for heating, and the power expert retain his economical condensing turbine if the heating and power are treated as one problem. This will involve the use of a great deal less for heating in pounds and the cooling effect of the heating system may be utilized to aid in condensing the engines, which makes for the greatest efficiency.

It is in this particular field that there is the greatest opportunity rather than in either the heating field or the power plant field as separate problems.

FUNCTION OF HEATING SYSTEM SHOULD BE KEPT IN MIND.

In making a selection, an analysis of the exact function of a heating system is in order, or a definition. A heating system is a series of conduits by which a fluid is heated at a source, such as a boiler or heater, and circulated to and from the space to be heated where the heat is dissipated. In the case of the hot-blast method, air is passed through a heater operated by steam, water or direct-fired air-tube heater and thence to the space to be heated. In the case of steam or water systems, a direct radiator dissipates the heat from the fluid.

The fluid may be wasted after the heat is extracted or returned to the boiler or heater to be reheated, involving a return system of conduits. The boiler, although an integral part of the heating system, should be considered by itself, as it is common to all the systems, and its efficiency in transferring the heat of the fuel to the medium should be considered separately. The boiler power necessary for each system, both in extreme weather and average weather should be taken into account.

It is readily seen that if a return system is not provided, there is a waste of heat in the fluid discharged, after being used, equal to that required to raise it from the initial temperature to that at which it is discharged from the heating surface. On the other hand, there will be a reduction in first cost by the omission of the return system. The above will apply to all systems, whether circulated by power or gravity. The waste of heat from a water system would be so great that a return system is absolutely necessary.

In all systems, the only loss is the radiation of the piping or conduits, which is dependent entirely on the temperature dif-

ference of the circulated medium and surrounding air, modified, however, by the efficiency of the insulation or covering, if used. The rate of transfer of heat from the radiation to the surrounding air is also dependent on this difference.

It is readily comprehended that there are quite wide limits within which the engineer can vary the temperature and volume of the circulated medium to convey the required amount of heat which will affect the first cost and operating expense. The lower the average temperature at which the medium is circulated, the larger the system and greater the first cost. Also the wider the range in temperature, or greater the difference in temperature of the medium between the supply and return, the less the cost of the apparatus and the less the efficiency.

The most economical system will also be the one employing a medium the temperature of which can be varied readily at will to meet outside weather conditions. Where a boiler or heater is used, and the heat is generated directly from the fuel, higher temperatures may be used with economy of installation and operation. Where waste heat from exhaust steam is to be utilized, lower temperatures are imperative for economical operation of the combined heating and power plant, as the lower the temperature of the medium, the lower the pressure temperature of the engine exhaust, and the greater the power economy.

TEMPERATURE AND PRESSURE OF STEAM NO INDICATION OF CAPACITY OR WORK ACCOMPLISHED.

In the consideration of any heating problem, it is well to remember that temperature and pressure are no criteria of capacity or work accomplished. It simply means a higher possible rate of doing work and economy in installation due to smaller mains and less heating surface.

The size of conduits and carrying capacity of a heating system depend on the drops in temperature of the medium or the amount absorbed at the heater and boiler and given up by the radiation. The higher the initial temperature, the greater the possible drop and the less heating surface required, reducing the first cost. Also, the greater the drop, the smaller the conduits and the greater the losses by radiation in transit, although the diameter of the smaller mains will reduce the loss, due to the smaller circumference.

In the selection of a medium such as air, steam or water, there are certain defined temperature limits and physical properties which gives one medium certain advantages over the other. The carrying capacity of a conduit for any medium carrying heat will be determined by the quantity absorbed by one cubic foot for a given loss in temperature. That is, if a cubic foot of air weighs 75/1000 lbs. and absorbs one-fourth of the amount of heat per pound absorbed by water at 62 lbs. per cubic foot, it is readily seen that for one degree drop in temperature the cubic foot of water will convey about 3,400 times the heat that a cubic foot of air will convey. The conduits in either case will correspond, although a more expensive conduit is required for water than for air, due to the nature of the fluid. This accounts for the impractical application of air systems to the transmission of heat any long distance.

Steam has a physical quality of giving up 1,000 B. T. U. approximately of latent heat when condensed to water, although it is 1,700 times the volume of water at atmosphere. It has a volume of 25 cu. ft. to the pound, so as, compared with water, with 25° drop, the quantity would be as follows for the transmission of one B.T.U., or any given quantity of heat:

25 (cu. ft. per lb.) ÷ 1000 (lat. ht.) : 62 (wt. 1 cu. ft. water) × 25 (pres. drop).

However, the velocity of the steam to the water in a conduit may be nearly this ratio due to the lighter density which places them nearly on a par when the drop in temperature of the water allowable is taken into consideration. The above figures are only intended to give an idea of how the natural physical properties of these media affect their use.

When the available velocities are taken into consideration, steam and water are about on a par as far as the size of conduits are concerned. The latter, however, requires a return conduit the same size as the supply, while the steam requires a return conduit only to convey 1/1700 of the volume.

When exhaust steam is used on steam heating central plants, the return is omitted generally on account of the power required to return it to the plant. This waste in operating expense, if the water enters the boiler at 50° to 60° and leaves the heating system at 180°, is equivalent to 12 per cent. in each 1,000 B. T. U., less the heat required to pump it back to boiler.

Another item that owners and architects pay little attention to is the building construction, especially the windows and roofs. It is possible in a large building, especially a high one, to cut down the cost of the heating system and a corresponding yearly operating expense, by paying a little

more for a roof that will not leak out so much heat.

Hot Air Systems.

The hot air system has the following characteristics: the air has a specific heat of 0.24 and requires a very large volume to carry any quantity of heat, also large ducts. When circulating the air, power is required generally and a very few B. T. U. will cause a wide loss in temperature, affecting the radiation of the ducts, which must be of large area. The hot air system, however, is very flexible in the regulation of temperatures to meet outside weather conditions, which is its most economical feature. The lower the temperature of the water or steam used to heat the air, the larger the volume of air required and the greater the increased cost of the apparatus.

Owing to the induced leakage, due to the circulation of the air, the hot air system has a very high peak load in extreme weather, about 25 per cent. more than for direct radiation, increasing the boiler capacity. The total fuel for the season, however, due to the flexibility of its temperature, is not very much different from direct radiation. It is, however, impossible to utilize temperatures below 212° on a fan system in the steam or water coils without greatly increasing the cost and operating expense, due to the large volumes and excessive heating surface required. If a wide drop in temperature is used, the volumes may be considerably reduced, making a lower cost apparatus, but if the building is high and the air is discharged at 130° to 140° to heat a building to 60°, the tendency is for the air to rise to the roof, increasing the roof radiation and increasing the heat consumption.

In selecting a fan system, see that there are fairly frequent air changes; not too great a difference between the incoming air and the room temperature and a proper distribution of outlets. Also note the roof construction.

This tendency of the heated air to rise can be overcome in a large measure by placing the fans at a high point in the roof and blowing the air to the floor. If the roof temperature is reduced 10° it will make a difference of 12 per cent. to 15 per cent. in the heat loss through that roof even when it is well constructed.

High velocities in the ducts are not objectionable except that they increase the power for the fan engine or motor, and decrease the radiation losses, due to the less exposed duct surface. In any case, increasing the power to drive the fans decreases the first cost and increases the operating expense. High temperatures of entering air also prevent proper diffusion and cause a loss in that manner.

It occurs in many fan installations that the available exhaust from the fan engine is more than sufficient to heat the building in moderate weather, so they really develop into a live steam proposition 40 per cent. of the time. Recirculation of air should be resorted to in all cases of manufacturing plants, except when commercial processes require fresh air, and then they should be especially provided for in a distinct apparatus. When exhaust steam is to be utilized at temperatures below atmosphere for engine economy, hot water circulation should be used, as it is impossible to heat a building with a fan system only, even with hot water circulation and obtain less initial temperature for exhaust steam operation. It may be done, however, at an excessive outlay in first cost of apparatus. The best method is to combine both the fan system with direct radiation on the same hot water system, reducing the size of both and arranging the system so that the fans will only be required in extreme weather, the direct surface being sufficient to take care of the buildings nights and Sundays.

This will work out at a moderate first cost and a very economical operating expense, the heating system forming an air condenser for the engines. Under these conditions, the fans may be operated by motors from the main engines at the most economical steam rates.

Direct Radiation Systems.

In the use of direct radiation, the most economical installation is with steam from 15 lbs. down, as plenty of pressure is available for flow and reducing the size of mains. The air is easily removed from the pipes and the piping can be installed so as to be noiseless, if the engineer understands his business. The loss in long mains between buildings is less for high pressure steam than for either water, air, or low pressure steam, due to the reduced diameter of pipes. High pressure traps may be used for returning the condensation at slight expense, this making closed circuits. By varying the pressure on the system, nearly the same regulation can be obtained as with hot water for outside weather variation. The first cost of the system is a minimum, and if properly laid out, should give as good satisfaction as hot water. However, it prohibits the use of exhaust steam, which is a serious drawback on a large plant.

Direct Radiation With Low Pressure Steam.

In the use of low pressure steam with a

vacuum, the air can be removed and noiseless circulation obtained, but when high vacuums are attempted on the return, the same difficulty arises as with high pressure steam. It is impossible to operate engines below atmosphere on a vacuum system and, as a rule, back pressure above atmosphere frequently occurs. The loss in low pressure steam mains from radiation is higher than either with forced hot water or high pressure steam. The condensation costs nearly as much to return in heat as that recovered from the return water, and is only economical where the saving of water is an object.

There is no flexibility in the system as the temperature is constant and the only way of regulating the temperature of the heated space is by hand control, by opening windows, or by automatic temperature control.

Fractional valves may be used, but then it is largely a matter of individual hand control, which, although very satisfactory from a heating standpoint, may not always tend to economical operation in a large plant. In small installations it does not make a large difference in operating expense what system is used as the first cost will govern largely and they can all be made to give satisfaction from a heating standpoint. The saving of one system over another would not be very great, as the total expense involved is comparatively small and the personal element in the operation will govern to a large extent.

Hot Water Systems.

Hot water may be circulated by gravity or pump, with steam to heat the water, if high pressure boilers are used for power, or with a hot water boiler, if no power boilers are installed. The same arrangement of piping should be used for gravity as with a pump installed in the circuit. The pumps, however, decrease the drop and size of mains, increasing the average temperature of the heating surface for a given initial temperature. Hot water systems may be operated at the same temperature as steam with more efficient results from a standpoint of material. The hot water may, however, be operated at much lower temperatures, if desired. There is no object in this, however, unless the source of heat is at a low temperature and it is desired to use by-products of engine operation.

Hot water circulation is the only system that combines the greatest flexibility of temperature control, with the most econamical operating expense, if properly installed. All steam and water circuits should be closed for economical operation, and drain traps, pumps and feed receivers should be omitted as, when used, the operating expense may be as wasteful as any other system. Hot water heating may be operated on high temperatures with a reduction in first cost without losing any of its advantages of flexibility, and closed circuits for both steam and water.

The only reason for operating with low water temperatures is when it is desired to use steam under vacuum from condensing engines, thus making a condenser of the heating system to the extent of its capacity. Twenty inches of vacuum may be carried, on an average, without any greater first cost on a large installation than for low pressure steam.

The same rules apply to the fan system, the greater the drop in temperature, the more surface required, and the lower the average temperature. Just the same, the less the drop the more water required, and the larger the pumps and power required to circulate. However, by more pumpage, higher average temperature may be used and less heating surface will be needed.

With two heaters, a gravity return for the live steam may be obtained without pumps, traps or other accessories on a high pressure boiler, and the same system may be operated with condensing engines at 20 in. of vacuum, with the exhaust heaters.

In considering the pumpage on a hot water system, as the heat is evenly distributed throughout the system, no matter how small the amount and if the mechanical work is all returned by the friction of the water, it simply means live steam operation to that extent.

The above is only a general dissertation designed to bring out certain physical facts regarding the different methods and would be in no way a condemnation of the selection of any one of the methods or systems for any individual case.

American Society of Mechanical Engineers.

The following nominations have been made for officers of The American Society of Mechanical Engineers: For president, Ira N. Hollis, Worcester, Mass.; for vice-presidents (for two years), Charles H. Benjamin, Lafayette, Ind.; Arthur M. Greene, Jr., Troy, N. Y.; Charles T. Plunkett, Adams, Mass.; for managers (for three years): Robert H. Fernald, Philadelphia, Pa.; William B. Gregory, New Orleans, La.; C. R. Weymouth, Berkeley, Cal.; for treasurer: William H. Wiley, New York.

LEGAL DECISIONS

Apportionment of Mechanic's Lien Among Several Houses.

A dealer in plumbing and heating supplies accepted from a general contractor a proposal for the plumbing and heating of a number of houses, but under an express agreement made with the owner personally that the latter would pay to the dealer directly for such material. After certain of the houses were completed, and before the remainder were begun, the owner became insolvent and was declared a bankrupt. The dealer filed a mechanic's lien for the material furnished. It was held that he was a contractor within the Pennsylvania mechanic's lien law and could file the lien. He was justified in not completing the balance of the contract, and was entitled to file a lien against the houses completed for the material furnished. The completed houses adjoined each other, or had contiguous curtilages. It was held that the dealer might determine the amount to be apportioned to each of the houses, but the justness of the apportionment might be inquired into at the trial.

Where a mechanic's lien has been apportioned among several houses, and the lien shows on its face the various items furnished, with the dates, and that all the material was furnished within the statutory time, the lien will not be stricken off because it fails to show the items of material which went into each house. If none of the material is actually furnished to a particular house within six months, this may be shown at the trial, but is no ground for striking off the lien.—Pierce, Butler & Pierce Mfg. Co. vs. Rogers, 60 Pennsylvania Superior Court, 293.

Action on Installation Contract.

A petition alleged that the plaintiff contracted with the defendant to install the plumbing and heating in a building, that the contract provided for payment upon architects' estimates as the work progressed, that payment of an estimate was refused, whereupon the plaintiff abandoned the contract, but that he afterwards furnished the work by special agreement with the defendant, that there was due and owing him for work performed and material furnished $1,200, after deducting $1,300 therefore paid, and after deducting from the contract price of $2,700 the reasonable cost and expense of installing the heating and plumbing, which sum of $1,200 was the fair and reasonable value over and above the amount paid for the work and material of which the defendant had availed himself, and which he had used, kept, and retained. It was held that, in the absence of an exception, the petition was sufficient to authorize a charge and a verdict either upon quantum meruit or for the balance of the contract price, as the amount due could be definitely ascertained in view of the allegation that the work was to be paid for upon estimates as the work progressed.—King vs. Collins, Texas Civil Appeals, 179 S. W., 899.

Duty of Purchaser of Plant to Minimize Damages from Defects.

In an action on an account stated for installing heating apparatus, in which the defendant counterclaimed for defective performance, it is held that an instruction that the jury could award the defendant such damages under her counterclaim, not exceeding the amount sought, "as you believe from the evidence the defendant was damaged on account of plaintiff's furnishing such defective material and doing the labor in a defective manner, if you believe from the evidence that the material and labor furnished by plaintiffs was defective," was erroneous, because too general, substituting the opinion of the jury for established rules of law as to damages, particularly in view of the fact that the evidence as to damages was vague and inconsequential at best. It was also held that a boarding house keeper, who contracted for the installation of a heating plant in her house, the work being defectively done, and who failed to make the plant good and sufficient herself, as she could easily have done before suffering any appreciable injury through want of such a heating apparatus, could not recover on her counterclaim against the parties who installed the plant any damages for defective performance beyond the cost of making it good and sufficient.—Niebaus vs. Gillanders (Mo.), 184 S. W., 949.

Right to Lien for Heating Plant.

Article 63, Section 2, of the Maryland Lien Law provides that in all cases in which a building shall be commenced and not finished the lien shall attach thereto to the extent of the work done or material furnished. It is held that under this section one who entered into a contract for the installation of a heating plant two months after the building was completed was not entitled to a lien. Section 3 of the act provides that every building erected, and every building improved to the extent

of one-fourth of its value, should be subject to a lien for the payment of all debts for work done and materials furnished. It is held that one whose bill in equity to enforce a mechanic's lien for the installation of a heating plant at the contract price of $1,182, in a building improved to the extent of $3,000, did not show that his improvement was more or to the extent of one-fourth of the value of the building in which it was placed, was not entitled to a lien under the section. Shacks vs. Ford, Maryland Court of Appeals, 97 Atl., 511.

Supplementary Tests of a Magazine Heater.

By E. H. Lockwood.

In THE HEATING AND VENTILATING MAGAZINE for May, 1916, p. 18, is a report of tests of a magazine steam boiler, made at the Sheffield Scientific School under the direction of Professor L. P. Breckenridge. The tests were made to study combusion in the magazine furnace, and the operating conditions were varied as much as possible. The fuels used were washed pea and yard pea (equivalent to No. 1 buckwheat).

It was found that the boiler would operate continuously at the maker's rated capacity of over 15 hrs. without attention, requiring only a cleaning of the fire and refilling of the magazine at the end of the period.

The boiler efficiency obtained was lower than that of surface-feed boilers of similar capacity under test conditions. The suggestion was made that lower furnace efficiency might be a characteristic of the magazine-feed with small-sized fuel. This point has not yet been demonstrated for magazine heaters as a class, and occasional tests have been reported showing high efficiency for this style of boiler.

Leaving this point for future settlement, it can be said that, based on the *cost* of the fuel, not on its weight, the efficiency of the magazine heater would be relatively high. The claims of the magazine heater for economy and convenience seem to be well demonstrated.

The sample test showing the performance of a magazine heater contained an error in the analysis of the fuel, which was given as 13,800 B.T.U. per pound of dry coal. More careful analyses have shown that this coal contained 10% ash and had a heating value 13,300 B.T.U. per pound of dry coal.

With the corrected figures the boiler efficiency is increased to 68.3%, a value which has been duplicated in many tests.

SAMPLE TEST OF A MAGAZINE STEAM HEATER.

Operated at 137% of rating. Fired once in 13 hours.

1. Date of test	Dec. 28, 1915.
2. Duration of test	26.15 hrs.
3. Water heating surface	123 sq. ft.
4. Grate area, projected	4.7 sq. ft.
5. Kind of fuel	Yard pea, equivalent to No. 1 buck.
6. Weight of coal fired (two firings)	693 lbs.
7. Average firing period	13 hrs.
8. Ash and refuse in coal	15.4%.
9. Total weight of water fed to boiler	6,080 lbs.
10. Moisture in steam by separator	0.4 of 1%.
HOURLY QUANTITIES.	
11. Coal burned per square foot of grate per hour	5.47 lbs.
12. Equivalent evaporation per hour from and at 212° F.	240 lbs.
PRESSURES AND TEMPERATURES.	
13. Average steam pressure by gauge	5.5 lbs.
14. Average temperature of feed water	185° F.
15. Average temperature of flue gases	265° F.
16. Average draft	0.11 in.
CAPACITY AND EFFICIENCY.	
17. Maker's rated capacity, square feet radiation	700 sq. ft.
18. Boiler capacity during test, square feet radiation	960 sq. ft.
19. Per cent. of rating developed	137%.
20. Water fed to boiler per pound coal as fired	8.78 lbs.
21. Equivalent evaporation from and at 212° per pound dry coal	9.37 lbs.
22. Calorific value of dry coal by analysis	13,300 B.T.U.
23. Over-all efficiency, based on dry coal	68.3%.

CORRESPONDENCE

Contractor's Guarantee for Heating System.

Editor HEATING AND VENTILATING MAGAZINE:

What is a model and standard form of guarantee from the heating contractor regarding steam, vapor or hot water heating systems, for residence work especially, a form that is liberal, but conservative, is adapted to nearly all jobs and which would create an atmosphere of confidence with the owner and builder? And suppose the owner or architect wanted a bonding company's liability policy (say one-quarter or one-third the amount of the contract) for one year to guarantee the successful working of the system. What form of guarantee would you advise the contractor to use?

A good guarantee for house heating work and one that will apply to all classes of work is as follows: "We will guarantee to heat all rooms containing radiators to 70° F. in zero weather without attention to the fire oftener than once in eight hours, provided, however, that the apparatus is maintained in continuous operation and the window frames are reasonably tight; also that the plant will operate noiselessly under all circumstances and circulate freely" (in case of steam heating, add "with no pressure showing"; in case of hot water heating, state the water temperature). This form of guarantee, which was used years ago, has become almost obsolete with the overrating of cast-iron boilers.

It is unnecessary to state the steam pressure, as it means practically nothing as concerns capacity. In order to increase the apparent rating of boilers, it was found that by reducing the operating pressure, or temperature, a larger number of square feet of radiation could be carried by the boiler and the lack of capacity of any boiler would not be so obvious. At the same time, the owner thought if he could get heat with no pressure on the boiler he was obtaining an apparatus of great capacity.

As a matter of fact, the reduction of the steam operating pressure in any given case simply lowers the temperature of the cast-iron radiation, increasing the required amount to be installed for any particular job and the owner receives a boiler of less capacity, if anything. If the job calls for 5 lbs. pressure and the same radiation is used as for no pressure, it is readily seen that a larger boiler will be required to maintain the higher pressure on the same amount of radiation.

There is this to be said, however, where no pressure is used, there is not so much danger from noise due to improper piping work.

Capacity of Fans to Carry Saturated Air.

Editor HEATING AND VENTILATING MAGAZINE:

I have been searching for some three or four years for an adequate explanation of the fact that air forced through a blower cannot be made to carry a humidity much in excess of 50 per cent. of saturation. The only reference I have been able to find is the following quotation from the Kent I had in college. I should like to have either a reference to a more modern discussion and scientific description of the reasons for this, because it is a decidedly important factor in the artificial drying of lumber.

(Slow Evaporation.—The principal idea carried into practice in machines acting by slow evaporation is to bring the wet substance repeatedly into contact with the inner surfaces of the apparatus, which are heated by steam, while at the same time a current of hot air is also passing through the substances for carrying off the moisture. This method requires much heat, because the hot-air current has to move at a considerable speed in order to shorten the drying process as much as possible; consequently a great quantity of heated air passes through and escapes unused. As a carrier of moisture, hot air cannot in practice be charged beyond half its full saturation; and it is, in fact, considered a satisfactory result if even this proportion be attained. A great amount of heat is here produced which is not used; while, with scarcely half the cost for fuel, a much quicker removal of the water is obtained by heating it to the boiling point.—Kent, 1899 edition, p. 466, describing experiments of Emil Passburg, Proceedings Mechanical Engineers, 1899.)

It will simplify a discussion of this question to consider what happens in the drying operation. In the first place, as the air becomes saturated and if there is no other means of heating it after its introduction, the temperature is bound to lower and the relative humidity is bound to increase. However, the determining factor is the relatively large amount of air which has to be handled in order to maintain the required temperature and overcome the losses through the walls, ceiling and floor of the dryer itself. Additional air has to be handled to take care of the heating of the cars or other conveying mechanism.

Under these circumstances it is not considered a good commercial proposition to attempt to saturate air much above 40 per cent., as the drying process would be slowed down to such an extent that the time required to do the drying would cause a greater amount of heat to be consumed than is necessary if the air is permitted to escape at a lower relative humidity.

There is no engineering reason, however, why the air cannot be completely saturated. In a plant installed by the American Blower Co., of Detroit, Mich., in Cuba, the air was applied at such a high temperature that they had complete saturation when the outside temperature was 90° F., the air escaping from the dryer having every appearance of steam.

It would be impossible to have 100 per cent. saturation with a low temperature of air, but it is an easy matter to have 70 per cent. or 80 per cent. at almost any temperature above the freezing point, if the volume of air is properly proportioned to the material to be dried and the material is such that it freely gives up its moisture. On the other hand, if the temperature of the air were applied above the boiling point, it would be easy to saturate it up to 100 per cent., if there is sufficient moisture freely thrown off by the material. The blower has nothing to do with the degree of saturation other than serving as a mechanical means of causing a movement of the air.

NEW DEVICES

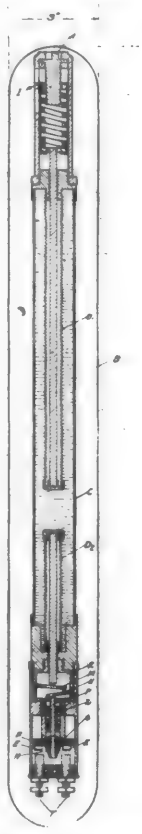
Sarco Thermo Switch.

A modification of the Sarco temperature regulator, designed to operate an electric switch, has been brought out by the Sarco Co., Inc., Woolworth Building, New York, under the name of Sarco thermo switch. This apparatus combines the expansion element of the ordinary Sarco regulator for steam, gas and water valves, with a specially-designed switch, as shown in the accompanying illustration. It is intended to furnish a means for operating electrically a switch for controlling a supply of current for heating, or a motor for the distribution of hot air, or for any other purpose requiring the control of an electric circuit by temperature changes.

The instrument has a calibrated scale from 58° to 78° F and is intended to operate the switch with a change of approximately 2° in temperature. It can be built for any temperature up to 325° F.

The operating mechanism employs a brass tube filled with a heavy hydro-carbon oil which, on expansion, compresses a Sarco spiral tube inserted in the oil. The expansion pushes a rod out of the end of a tube, the movement being multiplied by levers. A movement is obtained sufficient to operate the snap switch even with very slight changes in temperature.

In the illustration the instrument is shown



CONSTRUCTION OF SARCO THERMO SWITCH.

in the hot position, with the plunger extended. As the instrument changes to "cold" position, the rod R is slowly withdrawn into the tube, followed up by the plunger P. This operation is based upon the action of the spring X. The insulating member carrying the switch blade F is held in its illustrated position by the brass seat against which it rests.

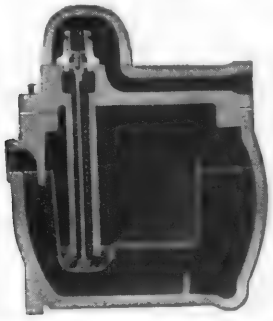
Therefore, when the plunger head is withdrawn slowly through this insulating member, it expands the spring S, which is an endless coil-spring free to roll from one end to the other of the plunger head. As

the plunger draws through this switch member F, the spring S expands and as the thickest part of the plunger head passes through the center of the spring S, the compression of the spring S causes it to travel down the plunger head taking along with it the insulating member containing the switch arms, which then hop over and locate themselves on the terminal posts T. This closes the circuit. This condition then obtains until the process reverses itself by application of a warmer temperature.

This switch, it is stated, is perfectly safe to operate on a 220-volt D.C. or A.C. circuit and it will carry 5 amperes. Its action is said to be very quick and positive. Also the device has been found to work with lamps in series without causing a flicker.

Swartwout Hydromatic Trap.

Two of Nature's unchanging forces, gravity and buoyancy, are applied in a new steam trap, which has just been brought out by the J. D. Swartwout Co., Cleveland, O. These two forces control the operation of the discharge valve through their effect on the float bucket to which the pull rod of the valve is attached. The trap contains but two movable parts, the discharge valve and the float. It is stated that the discharge valve and seat are practically the only parts



SWARTWOUT HYDROMATIC TRAP.

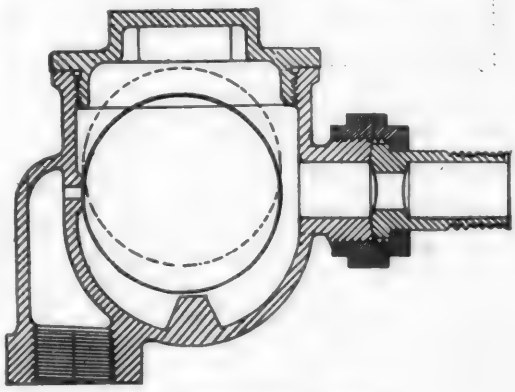
that ever need replacing. As these are made of a special metal, and their movement is intermittent, either wide open or shut tight, there is no chance to wire-draw.

The valve and seat are located in the top of the trap, enclosed in an independent chamber formed by the cap. This cap can be remved and the two parts exposed by removing the cap nuts.

As the Hydromatic trap is extra heavy, it can be used under any pressure from 0 to 250 lbs. It is guaranteed to perform up to its rated capacity. The trap is furnished in seven sizes, running from ½-in. up to 3-in. with corresponding radiation capacities of from 2,130 to 51,900 sq. ft. of radiation. The valves and seats are made in seven sizes (interchangeable).

A New Radiator Trap.

An interesting development in radiator trap construction is shown in the J-M radiator trap, made by the H. W. Johns-Manville Co., New York. It operates on the same principle as the J-M steam trap. There are but three parts, the body, connecting union and the rolling ball. The trap has no springs, counterweights, ther-



J-M RADIATOR TRAP.

mostatic parts, regulating screws, expanding liquids or restricted air passages. It can be used on any radiator connected on a two-pipe system and under any pressure ordinarily met with in heating, up to 10 lbs. It is stated that the trap will take care of the condensation from any radiator having a heating surface of 250 sq. ft. or less.

In operation, the hollow, seamless, unattached copper ball covers the discharge orifice and serves to prevent the loss of steam. When condensation enters the trap, the ball rolls up, exposing the discharge opening, permitting a discharge of water and air without loss of steam. This discharge, it is pointed out, is constant and automatic.

In a typical plant in the Roger Morris apartments, at Colonial Avenue and 160th street, New York, where 502 of these radiator traps are in use on the radiators and on the drips of risers, tests show that the system can be heated with ½-lb. gauge pressure, when the outside temperature is 10° F. When the gauge hovers around zero, the radiators on the top floor were hot. It was also noticed that even with quick steaming there was no hammering of steam in the pipes.

New Water Tube Heating Boiler.

A new type of heating boiler is soon to be put on the market. It will be known as the Seabury safety water tube heating boiler of the low water-line type, and will be manufactured by the Gas Engine & Power Co. and Chas. L. Seabury & Co. (consolidated), at Morris Heights-on-the-Harlem, New York. This firm has long made the Seabury water tube boilers for marine service. The new type will be built in units of 25, 45 and 60 H.P. and larger requirements will be met by combining two or more units. The boiler will be built for a safe working pressure of 50 lbs. The height from the floor to the drum has been kept down to 6 ft. 1½ in. One of the first installations is in the new Southern Drug Syndicate Building, in Houston, Texas.

Spun Glass as a Pipe Covering.

Successful experiments are reported from Germany in the use of spun glass as an insulating material. It is stated that, in addition to adding less to the weight of the pipes, it is considerably lighter even than cork. It is also insensible to the vibration of the pipes and is not affected by high temperatures, or by water, steam or acids. It is also found to be very durable.

In installing this form of insulation, rings of asbestos are placed at intervals around the pipes and between the rings the spun glass is wound loosely around the pipes. The whole is then enclosed in asbestos braid and sailcloth and painted with tar or oil-paint.

The spun glass consists of extremely fine glass threads, from 0.03 to 0.05 mm. in diameter, and forms loose, porous wadding. The insulating capacity of this material is said to be due not only to the air held in these interstices, but also to the fact that the mirror-like surfaces of the glass constantly reflect the heat.

How Often a Regrinding Valve Will Open and Close.

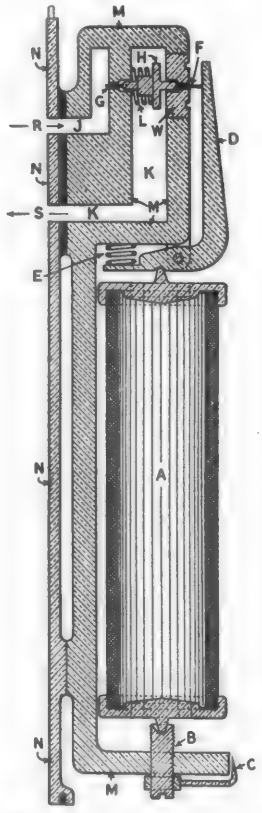
An interesting contest was conducted by the National Tube Company at the recent annual convention of the National Association of Master Plumbers, the competitors being asked to guess the number of times a "N. T. C." regrinding valve had been opened and closed. The valve in question had been in use in connection with a Kewanee union testing machine and those entering the contest were asked to base their guess on the appearance of the valve.

Several hundred estimates were received, the nearest to the correct answer being received from R. C. Gebhardt, 19 South 13th Street, Easton, Pa., of the firm of E. & R. Gebhardt, heating and plumbing contractors. Mr. Gebhardt's estimate was 4,250,000, whereas the actual number, as shown by affidavit, was 4,623,956 times. The prize was a walrus skin bag.

Two were tied for second place: Lewis S. Bowker, 312 Madison Avenue, Atlantic City, and John R. Reeves, 2301 South Hoover Street, Los Angeles, Cal., whose estimates were 5,000,000 each.

Trade Literature.

AMERICAN SYSTEM OF HEAT CONTROL is brought to the attention of the trade in a carefully-prepared catalogue issued by E. F. Houghton & Co., Philadelphia. This old-established company, which has long been a well-known manufacturer of petroleum lubricants, took up the marketing of heat-



THERMOSTAT USED WITH AMERICAN SYSTEM OF HEAT CONTROL.

A—thermostatic element. B—adjusting screw. C—indicator hand. D—lever. E—heavy spring. F—exhaust port. G—inlet port. H—valve. J—passage conveying air at 15 lbs. pressure. K—passage carrying air to the diaphragm motor or valve at the heating source. L—weaker spring. M—casing. W—adjusting block.

ing appliances in 1895, when it placed on the market the Marck steam trap. In December, 1915, the company purchased the business of the American Regulator Co., of Pittsburgh, together with the entire organization, thus combining the American system of heat control with the Houghton heating and engineering department. Fewer working parts, it is stated, are to be found in the American thermostat than in any other. It is made in two types, graduated and positive. The graduated type is designed to control the hot air damper in relation with the cold or tempered-air damper and it is also used on vacuum steam or hot water heating systems to operate the diaphragm radiator valves. The positive type is used to operate diaphragm control valves on either direct or indirect radiation where the system is one or two-pipe steam. A hollow, hard rubber tube is used as the thermostatic element. The caps on the top and bottom of the tube are perforated, permitting the circulation of the room air within the tube. A typical installation of a fan heating system is also shown in the catalogue, with graduated thermostat control, as is commonly used in schoolhouses. The American diaphragm radiator valve is also shown, being made in all patterns and sizes from ½ in, to 2 in., all made with rubber diaphragms. It is stated by the company that experiments are now being made with a metal diaphragm for use in a radiator valve and also for coil valves in connection with steam blast heating. The company also makes the American hygrostat for humidity control, the general construction of which is illustrated in the catalogue. Size 8 x 11½ in. Pp. 24.

CONNERSVILLE VICTOR BLOWERS and the many services they will render are listed in a compact circular issued by the Connersville Blower Co., Connersville, Ind. In addition to their use for vacuum heating work, they may be applied to gas appliances, gas furnaces, laundries, oil furnaces, brazing forges, soldering, vacuum cleaning, pneumatic conveying, cooling liquids, etc. Among their notable features are listed the following: no valves or valve ports, only two moving elements, no light or delicate parts, no internal contact or wear, no reciprocating motion, no reversals to limit speed, balanced at all speeds, minimum vibration, handles clean air (no oil required), has four large ring-oiled bearings, and is furnished in all sizes and capacities.

TUEC, THE HEART OF THE HOME, featuring the Tuec stationary vacuum cleaner, is the subject of new circular matter issued by the Tuec Co., Canton, O. This outfit is now made in fifteen sizes, and attention is called to the fact that it was awarded the international grand prize at the Panama-Pacific International Exposition.

HEART OF THE HEATING PLANT is the title given to the Minneapolis heat regulator in a circular describing this device which is made by the Minneapolis Heat Regulator Co., Minneapolis, Minn. In addition to showing the various styles of this instrument the circular reproduces comparative recording temperature charts with and without the regulator, showing the uniform temperature and fuel saving effected with the regulator in use.

HOT WATER IN ABUNDANCE FOR DOMESTIC SUPPLY is the title of a circular sent out by the Philadelphia Steam Heating Co., Juniper and Cherry Sts., Philadelphia, Pa., calling attention to the Philadelphia water heater which, it is stated, will perform the same service at a small fraction of the cost of heating by gas. The heater is a small coal-burning water-jacketed stove which may be set at any place in the basement near a chimney and connected to the range boiler or to an independent storage boiler. For the winter supply a connection can be made to the steam, water or vapor heater. It is figured that one hod of coal, at a cost of 5c. per day, will operate the heater during the summer. The heaters are made in a wide range of capacities.

MONASH VACUUM SYSTEM OF STEAM HEATING is presented in a convincing manner in a new catalogue issued by the Monash Engineering Co., Chicago, Ill. The unique diaphragm used in the Monash thermostatic return line valve is described in detail. It is in the form of a disc made of phosphor bronze, with metal walls 125 per cent. heavier, it is stated, than any other type of diaghragm. It is not attached to the cover or the body of the valve in any way, but is dropped into place in the valve between the plunger and adjusting screw. Another important feature of the Monash thermostatic return line valve, it is pointed out, is the dirt pocket constructed in the form of an inverted weir, producing a water seal and preventing the passage of steam to the diaphragm of the valve. The weir also acts as a deflector for the dirt, scale, etc., which fall to the bottom of the dirt pocket and may be removed by opening the by-pass screw. The dirt is then drawn by the vacuum into the return lines and finally into the Monash suction strainer at the vacuum pump. Typical layouts of a Monash vacuum heating system, with exhaust steam and a Monash vapor heating system, are

included, together with the necessary data covering Monash pressure regulating valves, Monash vacuum pump governors, Atlas noiseless back pressure valves and Monash suction strainers. Size 5¾ x 8¾ in. Pp. 28.

MOLBY DOWN-DRAFT BOILERS are discussed in a new edition of the Molby catalogue, issued by the Molby Boiler, Inc., 103 Park avenue, New York. In addition to describing this well-known heater, the catalogue contains many suggestions regarding the proper boiler to select, the proper coal to burn, and old and new methods of firing, while considerable space is given over to a discussion of chimneys, including such points as area, height and construction. Complete data are included covering both the Molby steam and water boilers. Size 4 x 8 in. Pp. 24.

New Webster Catalogue.

The importance of the modern engineering catalogue is reflected in the latest volume received from Warren Webster & Co., Camden, N. J., devoted to the Webster vacuum system of steam heating. In general scope and typographical appearance this catalogue takes rank with anything of its kind that has appeared in some time. After calling attention to the 28 years of this firm's activity in the vacuum steam heating field, during which time more than 500,000 radiators and coils have been equipped with Webster valves, the catalogue takes up "The Disadvanatges of Older Methods," and "The Application of Vacuum to Steam Heating," followed by carefully written matter on the advantages of the Webster vacuum system and the design and installation of this system. This goes into great detail and is profusely illustrated with such details as typical pipe coil connections, fan heater tappings and connections, up-feed and down-feed systems, lifts and grading of mains. A special section is devoted to the Webster sylphon trap and other sections take up the Webster No. 7 trap of the diaphragm type, and the Webster water-seal trap.

After describing these and other Webster specialties, considerable space is given up to the Webster modulation valve, with illustrations of its construction and application. Typical installations of the Webster hydro-pneumatic system and the Webster pres-co vacuum system are accompanied by descriptive text showing how each operates. Fifty pages of buildings equipped with Webster systems, which conclude the catalogue, form an impressive exhibit of the wide use of the Webster system. Size 8 x 10. Pp. 144.

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TRADE AND MISCELLANEOUS NOTES

Coming Events.

October 24-27, 1916.—Annual meeting of the American Public Health Association, in Cincinnati, O. Secretary, Selskar M. Gunn, 755 Boylston Street, Boston, Mass.

Deaths.

Oliver Schlemmer, Sr., Cincinnati, O., founder of the heating and plumbing firm of Oliver Schlemmer Co., died at his home in that city, July 15, after several weeks' illness. Mr. Schlemmer was 60 years old and had lived all his life in Cincinnati. He served his apprenticeship with the heating and plumbing firm of Thomas Gibson Co. and in 1879 formed a partnership with Richard Murphy, under the name of the Murphy-Schlemmer Co. This partnership was later dissolved and Mr. Schlemmer then formed the Oliver Schlemmer Co. and the Gibson-Schlemmer Co., the former specializing in heating work and the latter in plumbing work. Mr. Schlemmer was the inventor of the "O. S. Fitting" used in heating work and was the first in this country to use the Spence boilers which were a Canadian product, made later by the Pierce, Butler & Pierce Mfg. Co. He was one of the charter members of the Cincinnati Master Steam and Hot Water Fitters' Association. He leaves a wife and two sons, Oliver Schlemmer, Jr., chief engineer for the General Fire Extinguisher Co., Warren O. and Edmund Schlemmer, of the office of the Supervising Architect, in Washington, D. C. It is announced that the business will be continued by his brother, Clifford B. Schlemmer, who was associated with him for several years.

Patrick C. Doherty, Poughkeepsie, N. Y., a well-known heating and plumbing engineer and contractor, died at his home in that city June 23, of pneumonia. He was 65 years old. Mr. Doherty had been connected with the heating and plumbing trade

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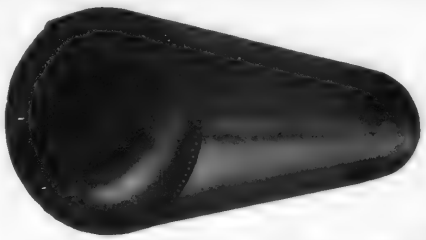

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For Large Apartment Houses, Hotels, Hospitals, Restaurants, and Public Institutions.

Long and Reliable Service Guaranteed.

Engineers recognize the high character of our product by specifying "The Dahlquist Boilers" on their most exacting work. **Write for catalogues**

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for 35 years. He was active in civic and philanthropic affairs and had an unusually wide circle of friends.

Hollinshead W. Taylor, senior member of N. & G. Taylor Co., Philadelphia, Pa., manufacturer of tin plate, died at his home in that city July 7, of heart disease. Mr. Taylor was 66 years old and was the last of the third generation of Taylors who founded or were identified with the company, the firm having been established in 1810 by his grandfather, William Taylor. When the McKinley tariff was passed, in 1891, the company made arrangements to manufacture high grade tin plate in this country and had the equipment and processes transported bodily from Wales.

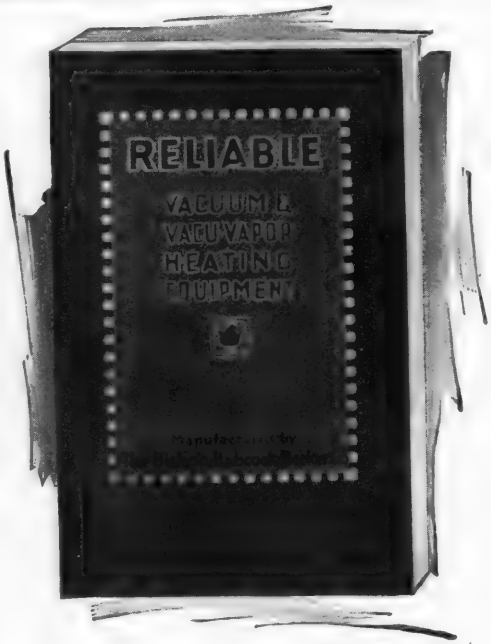
B. E. Van Auken, president of the Consolidated Engineering Co., Chicago, Ill., died at his home in that city August 1. Mr. Van Auken's death will come as a shock to his many friends in the trade, as he was one of the most widely-known men in the heating line. He was a pioneer in the vacuum heating field, being the designer of many of the well-known Van Auken steam specialties. He was about 55 years old.

Miscellaneous Notes.

Chicago, Ill.—A suggestion has been made by the Chicago Herald that the city's new recreation pier be equipped with heating apparatus so that it may be utilized in winter as well as in summer for dances, concerts and similar purposes.

Defiance, O.—A new heating plant, to cost $15,000, will be built at Defiance College to supply heat to all of the college buildings. It is proposed to have the plant in operation by October 1.

American Society of Heating and Ventilating Engineers' recommendations for minimum ventilation requirements, and, incidentally, the necessary floor space to be provided, have led to the publication of an item that is going the rounds of the daily papers in different parts of the country, under the caption of "Don't Crowd Pupils" and reading as follows: "Some recent recommendations of the American Society of Heating and Ventilating Engineers will be found to be valuable to communities planning community buildings or remodeling school houses, says the engineering extension division at Iowa State colleges. These men make the following statements: For



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of this big catalog, which contains lots of valuable information, data, charts and suggestions for specifications on Air Line and Return Line Vacuum and Vapor Heating Systems, and illustrates and describes thoroughly the big line of RELIABLE Vacuum and Vacu-Vapor Heating Equipment—RELIABLE Vacuum Pumps, VacUstats, Vacu-Traps, Vacu-Checks, Vacu-Graduate Packless Radiator Valves, "4 V" Vent Valves, etc. This will not obligate you. We want you to see this catalog. You will be interested in it!

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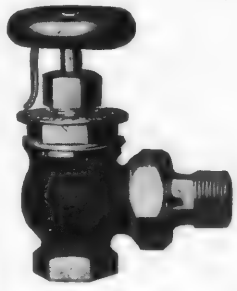
schools and colleges, class, study, lecture and recitation rooms, the floor area per occupant should not be less than 15 sq. ft. The cubic feet of contents per occupant should not be less than 180. In class and study rooms in primary schools for pupils under eight years of age, the floor area should not be less than 12.3 sq. ft. per pupil and the contents not less than 150 cu. ft. per pupil. Means should be provided in all schools for a supply of fresh outdoor air of not less than 1,800 cu. ft. for each occupant each hour. For best results, the temperature of school rooms should not be above 68°.

Sacramento, Cal.—An expenditure of $23,000 for a heating system at the California School for the Deaf and Blind at Berkeley has been authorized by the advisory board of the State Department of Engineering, as was another expenditure of $6,940 for a steam distributing system at the same school.

Northern Ohio Master Steam Fitters held their annual outing at Cedar Point, O., June 24, with an attendance of 175. Special trains took the party from Cleveland to Cedar Point, where the day was given over to sports. During the day a dinner was served at which Edward Mauer was appointed toastmaster by Vice-President M. L. Crowell. The speakers included Thomas Joyce, Cleveland; Mr. Hobaday, general attorney for the Cleveland Building Trades' Council, and Sam. Smith, manager of the heating department of the Cleveland branch of the Standard Sanitary Mfg. Co. The arrangements for the outing were carried out by a committee composed of Henry Hendricksen, chairman, William Chafer, president of the Chafer Company; Edward Bohm, secretary of the Cleveland Building Trades' Council; Charles Mallott, of the Schneider Plumbing Co.; and Sam. Smith, of the Standard Sanitary Mfg. Co.

Thomas J. Douglass, senior partner of Thomas J. Douglass & Co., heating contractors, Chicago, suffered a serious injury July 8 when his automobile was run into by an auto truck at Erie Street and Dearborn Avenue. Mr. Douglass's car was overturned and his arm broken. His son, Norman, who was driving, escaped with cuts and bruises. Mr. Douglass was taken to the Emerson Hospital in Evanston, where his rapid recovery was expected.

Building Operations for June make the best showing of any month of 1916. As reported by the American Contractor, of Chicago, the total for 103 cities is $91,768,080, as compared with $63,890,866 for June, 1915, an increase of 44 per cent. These figures, taken in connection with the high prices of building materials, is considered exceedingly gratfying. The principal gains were reported from New York, Chicago, Philadelphia, the figures in New York being $26,616,500, as compared with $12,265,764 for the same month last year. Chicago's total was $11,050,700, as compared with $7,613,500 in June, 1915. Pittsburgh showed a comparative loss, the figures dropping from $1,212,472 to $940,762. Other cities reporting



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losses included Seattle, Toledo, Topeka, Trenton and Troy.

Central Station Heating Notes.

New Ulm, Minn.—As the result of a joint meeting of the heating committee of the city council and the New Ulm Heating Co., a contract was awarded to the Healy Plumbing & Heating Co., St. Paul, Minn., to install a central heating plant to cover the district on Minnesota Avenue confined between Center and Second North Streets. The contract amounts to $21,626. Other bidders were J. G. Robertson, St. Paul, $29,962, and the Milwaukee Conduit & Insulation Co., $34,013. The efficiency guaranteed for the underground construction by the three bidding firms was: Healy Co., 89%; Milwaukee Conduit & Insulation Co., 90%, and J. G. Robertson, 92.5%. The joint committee decided that no set rule could be laid down for determining the insulation efficiency.

Mandan, N. D.—The Mandan Electric Company has prepared plans and specifications for the establishment of a central heating plant to serve three blocks from the First National Bank to the interocean Hotel. It is planned to have the plant in operation by Fall.

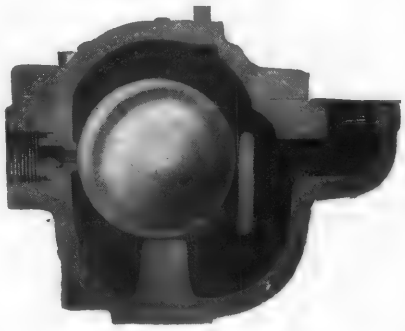
Salt Lake City, Utah.—The Covey Investment Company is planning to construct a central heating plant on a site which it has recently purchased at First Avenue and A Street. The plant will supply the Covey Apartments, the Covey Annex and the Hillcrest Apartments.

St. Joseph County Heating Co., South Bend, Ind., has been granted authority by the Indiana Public Service Commission to issue $150,000 in demand notes in order that the company may comply with the provisions of a contract it has made with South Bend for heating service. The commission in its order says the purchaser of the demand notes will be given the right to take over the capital stock of the company at 90% of its par value. Authority is granted in the same order for the company to issue $165,000 additional capital stock to be taken over by the purchasers of the demand notes.

Devil's Lake, N. D.—F. E. Corson, president of the General Utilities Co., has had a force of men at work in Devil's Lake surveying the business center of the city, preliminary to running heating pipes. The company proposes to furnish heat for a portion of the downtown district commencing in the Fall. A viaduct will be built under the Great Northern Railroad tracks.

Only One of its Three Parts Moves
No Levers, Cams, Valves or Stuffing Boxes

Look at at. Could a steam trap be simpler? A body, a discharge bushing and a rolling ball. And yet nothing could be added to make it a better or more efficient trap.



Steam pressure forces the ball against the discharge bushing. As the condensate rises, it rolls the ball up and away from the orifice.

This allows the escape or ejection of the water and the heavy air and gases simultaneously. The discharge is continuous until the water level permits the ball to roll back into place sealing the orifice.

No air binding or loss of steam is possible. It will discharge water against any back pressure less than pressure at the trap.

Write to our nearest branch. They will gladly show you the trap and quote you.

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Appearance

In addition to permanent efficiency, genuine Detroit Packless Radiator Valves have an unusual pleasing appearance, giving a smooth, satin finish, never before equalled in radiator valve construction.

They are finished with the definite purpose that they shall harmonize with the most beautiful surroundings, and retain that appearance always. The large, easy-turning handle has a beautiful mahogany finish. This handle will not crack or split, and as a further precaution in keeping it cool there are ventilating holes in the handle follower.

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LARGEST MANUFACTURERS OF RADIATOR VALVES IN THE WORLD

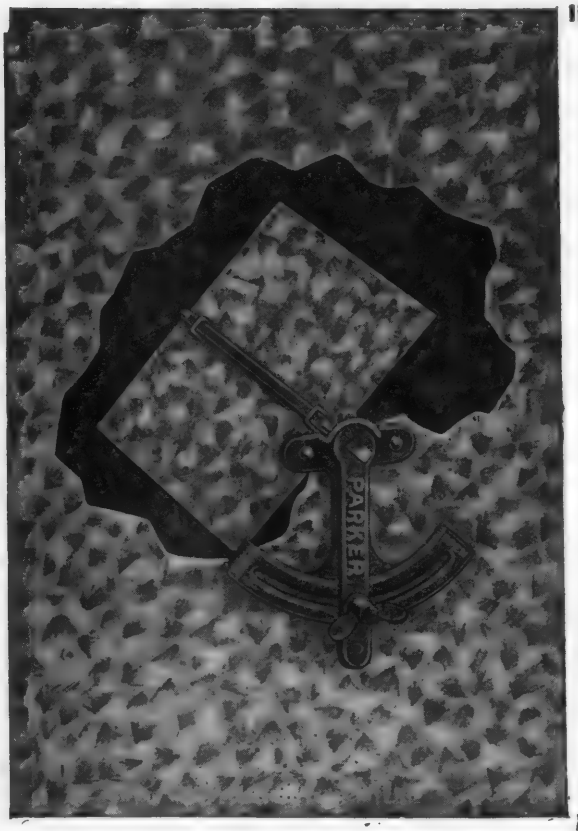
Carried in stock in all sizes in all principal jobbing centers

Newcastle, Ind.—A plan is on foot in Newcastle to install a joint lighting and heating plant to heat half a dozen or more business buildings on Broad and Fourteenth Streets. These buildings have a combined frontage of over 400 ft. and contain about 15,000 sq. ft. of radiation. They have been paying about $3,000 a year for heat to the Interstate Public Service Company. It is stated that as a heating plant can be operated at a minimum cost in connection with an electric light plant, it is likely that both will be put in. Strictly private interests, made up of owners of the buildings concerned, will control the plant and it is not intended to furnish heat or light to any others. The buildings that will be served from the plant are the Union and Colonial Buildings on Fourteenth Stret, the Jennings Building, the New York Store, the Heller Block, the Bond Building, the Koons-Bond and McQuinn Building and the Chambers-Baily Building.

Tacoma, Wash.—The city council is considering the restoration of the heating franchise of the Tacoma Central Heating Co. A franchise was given this company some time ago, but was rescinded when the company failed to begin construction work within the stated limit. The appeal for a restoration of the franchise was made by Vaughan Morrill, secretary of the American Wood Pipe Company, who offered to deposit a certified check for $1,000 with the council as an indication of good faith. The matter was taken under advisement.

Lebanon Steam Heating Co., Lebanon, Ind., at its annual meeting, decided on extensions of its system in that city.

Columbia City, Ia.—A number of cities have sent representatives to Columbia City recently to inspect the steam heating plant there which managed last year to heat three municipal buildings at a lower cost than has been reported elsewhere. The heating of the court house and two school buildings was done by utilizing the exhaust steam formerly wasted at the water and light plant. Despite the fact that this steam had to be carried over 3,100 ft., it was found sufficient to heat the buildings with the exception of five days of extreme weather when it was supplemented by live steam. The installation cost $20,000, but saved the construction of new heating plants in the three buildings. It is estimated that this sum will be paid back in a few years through the savings in fuel.



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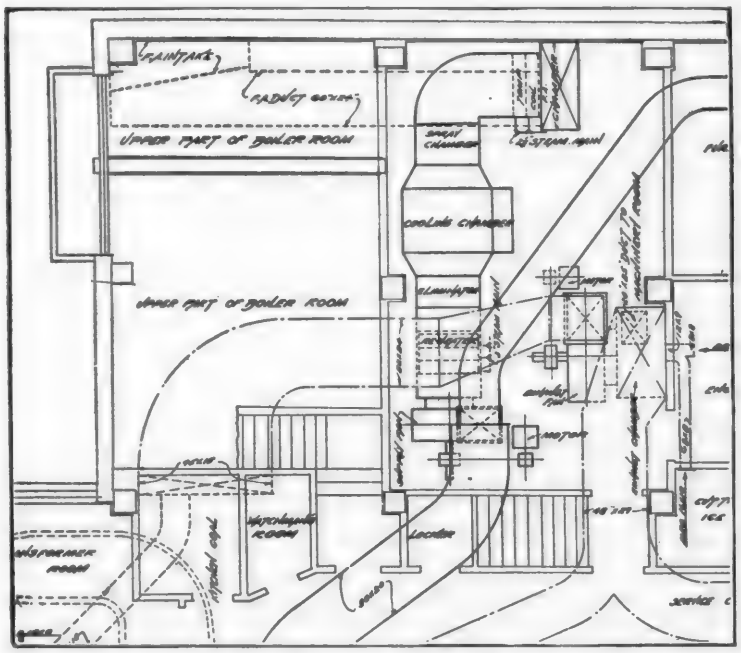

Plan of Part of Basement of the Miami Hotel, Dayton, Ohio, Showing location of Sturtevant Heating and Ventilating Apparatus and Air Washer. M. L. Stevens & Co., Architects and Engineers—Every Hotel should have a Sturtevant Air Washer.

Sturtevant Air Washer

(REG. U.S. PAT. OFF.)

With Cooling Chamber in Miami Hotel

The Miami Hotel in Dayton, Ohio, just completed, is as modern and up-to-date as any hotel in the country. The Air Washer, equipped with refrigerating coils, enables the temperature to be maintained at 70° the year round.

In summer coolness appeals more to guests than anything else. It is a powerful advertising feature and any hotel can make big capital of it. Managers will appreciate your installing a Sturtevant Air Washer with cooling chamber.

The advantages of Sturtevant Apparatus and the service rendered by the company back of them are two forces constantly at work extending the number of buildings in which Sturtevant Air Washers are being installed. We should be pleased to consult with heating and ventilating engineers on problems big or little.

Send for Bulletin 226-V

B. F. STURTEVANT COMPANY

HYDE PARK, BOSTON, MASSACHUSETTS

AND ALL PRINCIPAL CITIES OF THE WORLD

Jerseyville, Ill.—The Central Illinois Public Service Company has petitioned the Board of Supervisors for a release from its contract to heat the court house, claiming that it lost money on its heating contract last year to the amount of $920. Power is now obtained from Keokuk and the plant in Jerseyville is run solely for heating purpose. The company is willing to spend $1,000 for a release from its contract, $592 to go to the court house and the remainder to other customers, according to the amount of heat used by them. In case the contract is canceled it will be necessary to install a new boiler in the court house as well as in the library, State Bank Building and the Bull Building.

Spokane, Wash.—A proposal of the Washington Power Company to supply heat to the city hall has been rejected by Commissioner McBroom, who stated that he would report favorably on the proposal of the Merchants' Central Heating Co. The Merchants' Company has had a bid in for some time for heating the city hall, offering to heat the building at a maximum cost of $4,500. The Washington Water Power Co. asked permission to put in a bid and at the same time outlined a scheme by which the water company proposed to use the city hall heating plant to capacity and sell the excess heat to some other building. A rate war between the two companies on electric service has been started with the announce-

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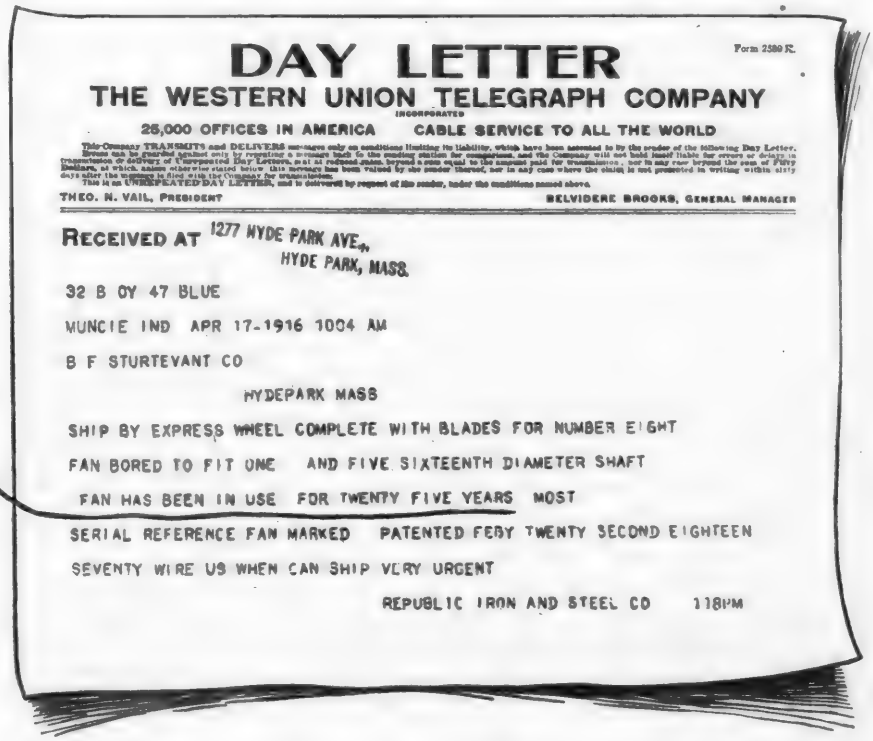

DAY LETTER

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INCORPORATED

25,000 OFFICES IN AMERICA CABLE SERVICE TO ALL THE WORLD

This Company TRANSMITS and DELIVERS messages only on conditions limiting its liability, which have been assented to by the sender of the following Day Letter. Errors can be guarded against only by repeating a message back to the sending station for comparison, and the Company will not hold itself liable for errors or delays in transmission or delivery of Unrepeated Day Letters, or for recovering more, beyond a sum equal to the amount paid for transmission, nor in any case beyond the sum of Fifty Dollars, at which, unless otherwise stated below, this message has been valued by the sender thereof, nor in any case where the claim is not presented in writing within sixty days after the message is filed with the Company for transmission.

This is an UNREPEATED DAY LETTER, and is delivered by request of the sender, under the conditions named above.

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FAN HAS BEEN IN USE FOR TWENTY FIVE YEARS MOST

SERIAL REFERENCE FAN MARKED PATENTED FEBY TWENTY SECOND EIGHTEEN

SEVENTY WIRE US WHEN CAN SHIP VERY URGENT

REPUBLIC IRON AND STEEL CO 118PM

Sturtevant fans are built just as carefully today as they were 25 years ago.

Our engineers will co-operate with engineers and architects on all problems in heating, ventilating and air conditioning.

B. F. STURTEVANT COMPANY

HYDE PARK, BOSTON MASSACHUSETTS

And All Principal Cities of the World

Sturtevant

Reg U. S. Pat. Office.

ment by the Washington Power Company of a sweeping reduction in its rates beginning September 1. Manager E. Darrow, of the Merchants' Company, declares that the rates of his company will be lower than those of the pioneer company. He also stated that the reduced rates offered by the Washington Power Company apply only to those districts which have been invaded by the Merchants' Company.

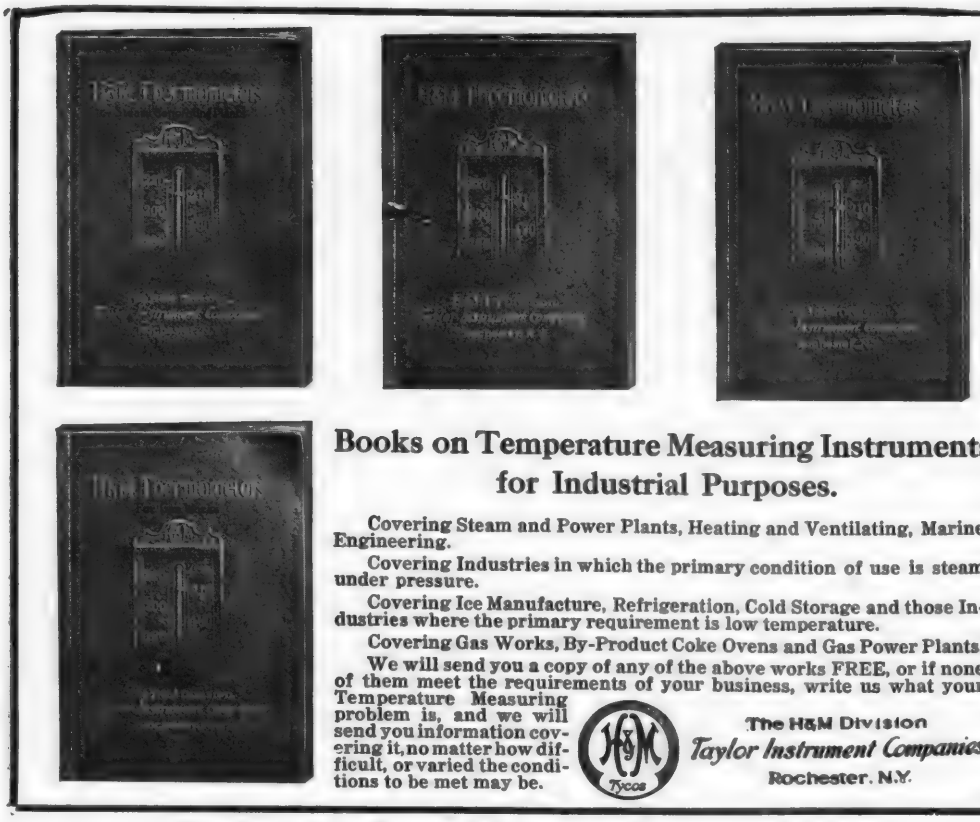
Davenport, Ia.—The Davenport city council has practically decided to grant the 20-year extension of the heating franchise asked by the Davenport Gas & Electric Company. The amendment to the ordinance which provided that 6¼ of the gross receipts of the company be turned over to the city for the use of the streets was lost. H. C. Blackwell, general manager of the company, before the vote was taken, announced that under no conditions would the company agree to the 6% amendment. Mayor Berwald, who voted against the amendment, stated that he was satisfied the company was not earning over $1,675. The council will vote on the orignal franchise after it has been published three or four weeks. Those who objected to the renewal of the franchise said that their principal objection was that the franchise did not say what the company was going to give the people and that the rates were not specified. It was also claimed that the rates had been advanced. It was explained by Mr. Blackwell that the city council has the right to fix the rates at any time. Another objector claimed that the city should receive some revenue for the use of the streets.

Manufacturers' Notes.

A. W. Cash Co., Decatur, Ill., has taken over all of the property and assets of Cash & Lemmon and will continue to manufacture the line of pressure reducing and regulating valves made by its predecessors. Mr. Cash was formerly located in Newark, N. J.

Piece, Butler & Pierce Corporation, New York, held a meeting of its officers and sales managers and all of the Greater New York salesmen June 17 at the company's headquarters in New York. A dinner followed the meeting, the principal speaker being President J. T. Duryea, who reviewed the progress of the past year and expressed his anticipation of excellent business during the coming year.

Shirley Radiator & Foundry Company's plant, at Beech Grove, Indianapolis, Ind., including foundry and machine shop, was put up for sale at auction June 29, by Russell T. MacFall, trustee.


Books on Temperature Measuring Instruments for Industrial Purposes.
Covering Steam and Power Plants, Heating and Ventilating, Marine Engineering.
Covering Industries in which the primary condition of use is steam under pressure.
Covering Ice Manufacture, Refrigeration, Cold Storage and those Industries where the primary requirement is low temperature.
Covering Gas Works, By-Product Coke Ovens and Gas Power Plants.
We will send you a copy of any of the above works FREE, or if none of them meet the requirements of your business, write us what your Temperature Measuring problem is, and we will send you information covering it, no matter how difficult, or varied the conditions to be met may be.
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Tycos
The H&M Division
Taylor Instrument Companies
Rochester, N.Y.

Hudson's (Detroit) Basement Store where "Sirocco" washed air increased $1,000,000 sales ten per cent.

"Sirocco" Saves 50,000 Dollars in One Department

The "Basement Store" at Hudson's great department store in Detroit furnishes a way of disposing of small stock of left-overs and attracting to the store a number of customers who might go elsewhere. It also solved the problem of using the extra basement space which had come with additions to the original building.

Sales the first few months indicated a million dollar a year business.

Then the warm wave. Sales in the Basement Store fell alarmingly. A clue to the troubles lay in the "hospital records" of the salesforce. Customers noticed the difference and suggestions like "Let's go back to the new side," showed which part of the Basement Store was pleasantest to shop in.

The new basement store was supplied with cooled washed air—the plans called for an Air Conditioning System.

An emergency order was sent to the American Blower Company and in a short time a Sirocco System was installed in the Old Basement without interrupting business.

With both sides of the Basement Store ventilated, business picked up. Instead of a million dollar business, there was over one and a half million, and Mr. Douglas, chief of the floor managers of the Basement Store, says that the most conservative estimate must credit the Sirocco System with 10% of the increase. 10% of half of a million!

Now is the hot season when similar business problems are to be found in the stores of your town. Cannot you find one and solve it? Write for Air Conditioning Bulletin.

AMERICAN BLOWER COMPANY

DETROIT, MICHIGAN

BRANCHES EVERYWHERE

C. A. Dunham Co., Marshalltown, manufacturer of the Dunham heating specialties, has opened a branch office in Albany, N. Y., at 322 Arkay Building. A. B. Hixson, who has been connected with the home office for several years, is in charge of the new branch.

Kelsey Heating Co., Syracuse, N. Y., has opened a branch office in Detroit for the sale of the Kelsey warm air generators. Quarters have been taken in the Builders' Exchange. The new branch will be under the management of J. P. Moran.

Sarco Co., Inc., New York, manufacturer of the radiator trap Sarco, has appointed Newton-Johnson, sales engineers, as the company's sales representatives in Wisconsin and the northern peninsula of Michigan. Newton-Johnson's headquarters are in Milwaukee.

Bishop-Babcock-Becker Co., Cleveland, Ohio, announces the removal of its New York quarters to 376-380 Lafayette Street,

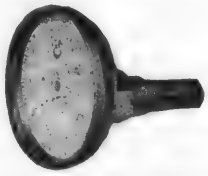
BISHOP-BABCOCK-BECKER COMPANY'S NEW YORK BRANCH.

corner of Great Jones Street. Here the branch occupies an extensive display room and offices where the company is better equipped than ever to take care of its eastern business. In addition to its line of Re-

Accurate Service Is Assured When You Use

Standard Indicating and Recording Thermometers

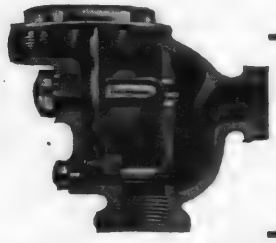
Guaranteed Correct



Iull line includes seven types of recording thermometers and a special line for mechanical uses ndicating mechanical thermometers are furnished with extensions from 2 to 30 in. in length

All thermometers are double and not breakable.

STANDARD THERMOMETER COMPANY Clinton and Shirley Streets **BOSTON, MASS**



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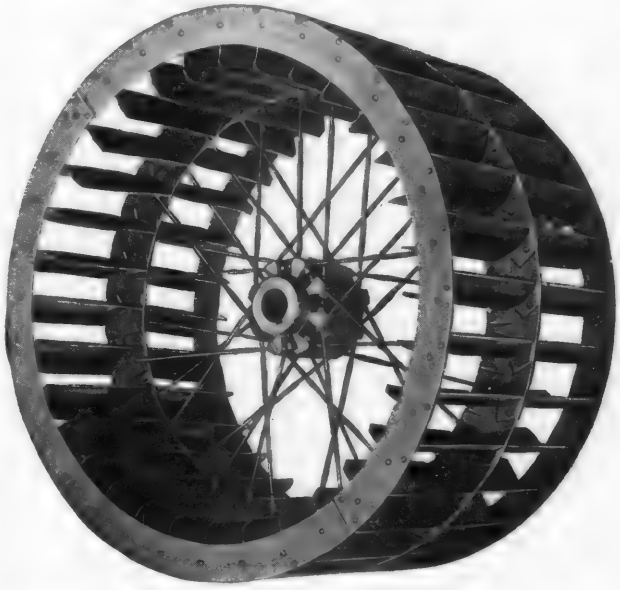

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High Pressure Steam

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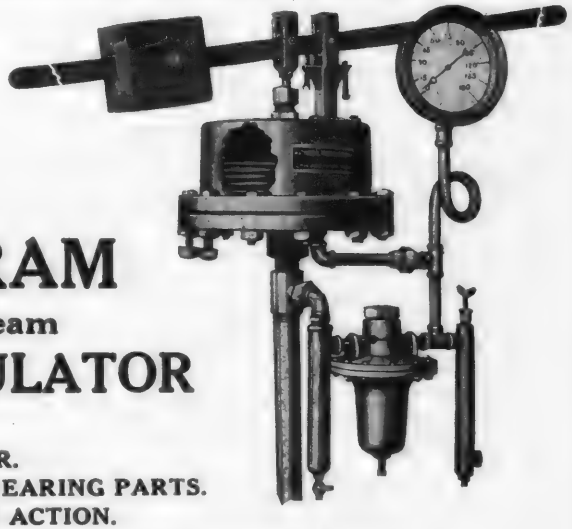

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Manufacturers of all types of Automatic Temperature Regulating and Humidifying Apparatus

liable vacuum heating equipment, including electric and hydraulic pumps, valves, strainers and regulators, the company manufactures an extensive line of soda fountains, carbonators, etc. The new quarters give the New York branch over 20,000 sq. ft. of floor space, 12,000 sq. ft. of which is used for display purposes.

New Incorporations.

Dooley & Bruninga, Peoria, Ill., capital $10,000, to conduct heating and plumbing contracting business. Incorporators: Samuel Dooley, Jacob Bruninga and Henry Mansfield.

John G. Loos Plumbing & Heating Co., Sterling, Ill., capital $5,000. Incorporators: William C. Loos, Carl C. Loos and Fred G. Loos. The new company succeeds the John G. Loos Plumbing Co., the new organization following the retirement of John G. Loos after nearly 23 years of business activity. His three sons will control the new company.

Sanitary Refrigerator & Heater Co., Dover, Del., capital $3,000,000, to manufacture refrigerators, water shelving, gas and steam heaters, etc. Incorporators: S. T. Smith, Albert P. Gordon, John R. Harris, all of New York.

Buffalo Asbestos Co., Inc., Buffalo, N. Y., capital $5,000, to sell and install insulation and heating plant coverings. Incorporators: R. C. Palmer, C. G. Curtiss and H. Y. Patton, all of Buffalo.

Sibley Heating Co., Sibley, Ia., capital $15,000. President, E. M. Taylor; vice-president, C. W. Brown; secretary, W. T. Steiner; treaserer, H. E. Scott.

Practical Mfg. Co., Cleveland, O., capital $25,000, to manufacture heating specialties. Incorporators: Charles H. McCarty, W. A. Robinson and F. H. Sherman.

Ozaukee Heater Co., Saukville, Wis., capital $50,000. Incorporators: Claus de Buhr, H. L. Cary and W. Grady.

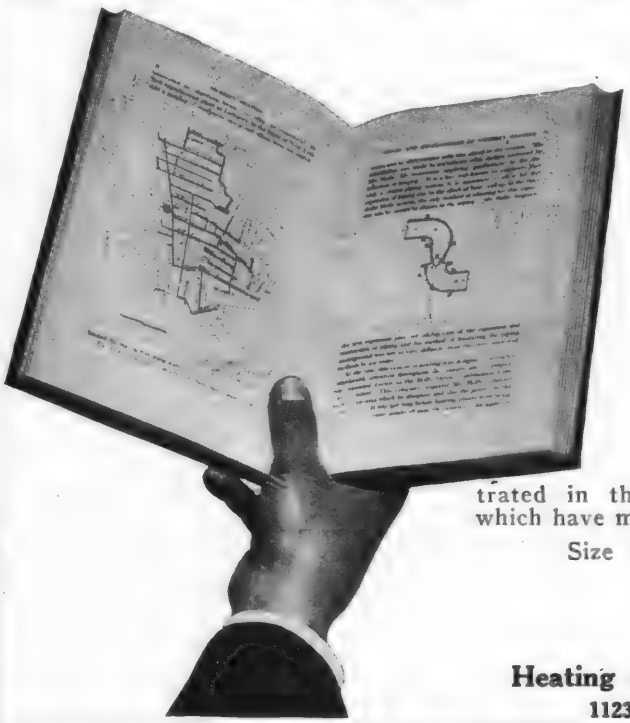
J. J. Fitzgerald Co., Lexington, Ky., capital $100,000, to take over the heating and plumbing business of J. J. Fitzgerald. Incorporators: J. J. Fitzgerald, C. Barry Shannon and H. N. Johnson.

New Firms and Business Changes.

Theodore Held Co., Fremont, O., heating and plumbing contractors, has been organized by Mr. Held. The company has taken quarters on Croghan Street.

Heating Rates in Forty Cities, and Ten Typical Heat Distribution Systems

are contained in



District Heating

A Full and Practical Treatise on Central Station Heating

By S. Morgan Bushnell and Fred. B. Orr

This book is written primarily to promote the interests of district heating companies. For this purpose various points in economical operation are suggested, as illustrated in the methods practiced by companies which have made a success in this line of work.

Size 6x9 in. 300 pages. 81 figs.

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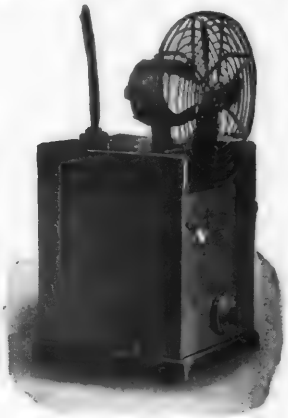

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Westinghouse
Ventilating Equipment

The remarkably successful results which come from the use of Westinghouse Ventilating Equipment are to-day attracting the attention of leading architects, engineers and contractors.

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Contracts Awarded.

Cook-McDonnell Heating Co., Oklahoma City, Okla., heating and ventilating and plumbing new high school building in Tulsa for $73,714.

W. G. McPherson, Portland, Ore., heating and ventilating high school addition in Hood River for $30,000.

Appling-Griggs Co., Portland, Ore., heating and ventilating high school in Baker for $17,825.

Willey & Calhoun, Portland, Me., heating and ventilating new Portland High School for $90,000. The same firm installed the heating equipment in the old high school building over 20 years ago.

Chapman Plumbing & Supply Co., Canton, O., heating and ventilating and plumbing at the Daniel Worley School for $14,765 (for the heating and ventilation) and $7,677 for the plumbing, less the work already done on the first unit of the building.

Bryce Heating and Ventilating Co., Toledo, O., heating and ventilating the new high school building at Birmingham, Mich., for $23,364. The plumbing contract went to Eames & Brown, Pontiac, at their bid of $9,350.

M. D. Holmes & Sons Co., Worcester, Mass., heating Ledge Street School for $11,792. Other bidders were: A. Burlingame Co., $13,653; J. W. Cahill & Son, $13,792; N. J. Smith, $13,864, and M. J. Maher, $13,492.

Peters & Eichler Heating Co., St. Louis, Mo., was the low bidder, at $98,648, for the heating and ventilating of the Erie Academy High School in Erie, Pa. Other bidders were: George H. Soffel Co., Pittsburgh (plumbing only), $23,347; Gannon & Cary (heating, ventilating and plumbing), $125,931.

Portland, Ore.—Bids for the heating and ventilation of the new Auditorium Building were rejected by the city council as the result of dissension over the bid submitted by Appling-Griggs Co., low bidders, which erred in its offer. Rushlight & Hastorf, the next lowest bidder, sought to have the council award them the contract, but it was decided to advertise for new bids. The contract will amount to approximately $45,000.

Peters-Eichler Co., St. Louis, Mo., submitted the lowest bid, at $31,661, for the heating and ventilating of the new Bates School, in St. Louis. In connection with the plumbing bids, the fact that the specifications called for a continuous vent system, which is forbidden by the city ordinance, served to deter any plumbing contractors from submitting bids. The Board of Edu-

SCOTT RADIATOR VALVES

With Jenkins or Bronze Disc

have maintained a high reputation for over twenty-five years.
While moderate in price, they are of good substantial construction, being designed not merely on the theory that they are good enough to stand five or ten pounds pressure, but consideration is given to the strain of installation.
They are made of good steam metal and of sufficient weight so that they are not warped out of shape in connecting.
There is no loss of time to the steamfitter on account of replacement from this source.
The tail pipes are longer than is usual on most valves, allowing of easy coupling.
The valves are heavily plated and highly polished, making a fine appearance in any class of work.

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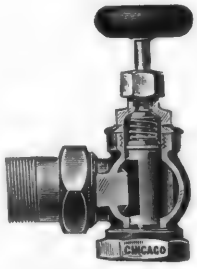
This valve has all the merits of self-packing, so the stuffing box can be packed at any time without shutting off the water. The body is heavy, symmetrical and of the best steam metal, so no danger of twisting to pieces while connecting it. The disc is cast brass and of good weight, with by-pass that assures perfect circulation.



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DISTRICT HEATING. By S. Morgan Bushnell and Fred. B. Orr. This book not only imparts a general knowledge of district heating, but contains many points on economical operation, as illustrated in the methods practiced by central station heating companies which have been successful in this field. Comparative data are also presented indicating the prices that can reasonably be charged for heating service. Size 6 x 9 in. 300 pages. 81 figs. Cloth, $3.00.

CENTRAL STATION HEATING. By Byron T. Gifford. This work presents the most advanced practice in central station heating, both steam and hot water, and is an invaluable guide, not only to the engineer, but to municipalities and public service commissions where district heating is being, or will be, used. 208 pages, with 42 figures, including 50 pages of miscellaneous engineering data. Size 6x9½ in., bound in flexible leather. Price, $4.00.

VACUUM CLEANING SYSTEMS. By Maxwell S. Cooley. A reliable data book for engineers, architects, heating contractors and plumbers interested in the correct design and installation of mechanical cleaning plants. Size 6 x 9 in. 244 pages. 105 ills. 20 tables. Price, $3.00 postpaid.

VENTILATING DUCTS. By C. E. Pearce. A set of six tables printed on heavy Bristol board, for rapidly estimating the superficial area and weights of galvanized iron rectangular ducts used in ventilating work. Size 7 x 9 in. Price, 50 cents.

ELEMENTS OF HEATING AND VENTILATION. By Arthur M. Greene, Jr. A text book for technical students and a reference book for engineers. 330 pages. Size 6 x 9½ in. 228 ills. Price, $2.50 postpaid.

EVERREADY PIPE AND ELBOW CHART. By M. W. Pehl. An ingenious calculator made of celluloid for laying out and cutting all kinds of elbows, pipe and ventilation work. With 54-page book of instructions. Price, $1.00.

MECHANICS OF HEATING AND VENTILATING. By Konrad Meier. Including a series of ten charts containing data relating to the flow of water, steam and air, collected by Mr. Meier during an experience of 26 years in heating and ventilating work, both in this country and abroad. Each of the charts replaces a series of tables on the subject, giving at a glance the result of a calculation from any combination of factors. 161 pages, illustrated, with ten large charts. Size 6 x 9 in. Price, $5.00. Separate sets of charts, printed on cloth, with lines in different colors and mounted on boards. Single charts, $1.50. Sets of ten charts, $15.00.

HEATING AND VENTILATING BUILDINGS, a standard manual for heating engineers and architects. By Prof. R. C. Carpenter. Sixth edition, largely rewritten. 577 pages, 277 illustrations, 8vo, cloth, $3.50.

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DESIGNING HEATING AND VENTILATING SYSTEMS. By Charles A. Fuller. A textbook which treats both the theoretical and practical side of the subject in a simple, but clear and comprehensive manner. Instruction given covering the design any kind of heating or ventilating system. 224 pages. Size 6 x 9 in. 78 figs. and 37 tables. Cloth, $2.00.

PRACTICAL STEAM AND HOT WATER HEATING. By Alfred G. King. Containing over 300 detailed illustrations. The book is a working manual for heating contractors, journeymen steam fitters, architects and builders. Describes various systems of heating and ventilation and includes useful data and tables for estimating, installing and testing such systems. 8vo. 367 pages. Price, $3.00.

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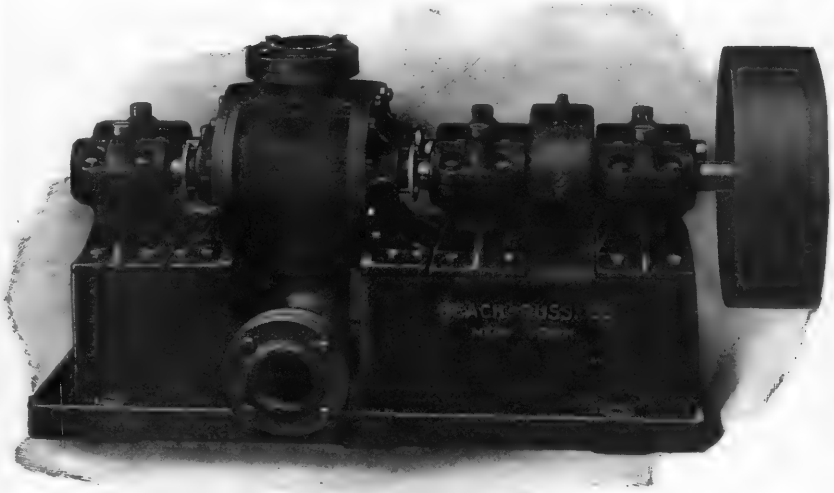

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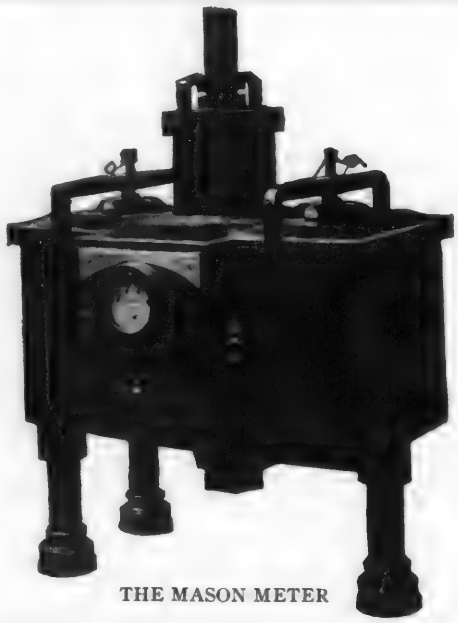

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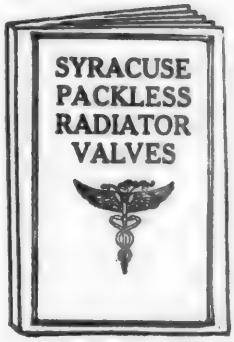

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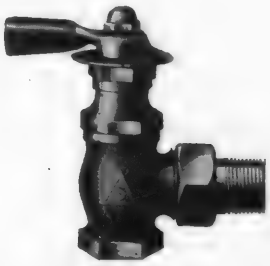
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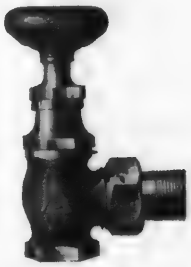
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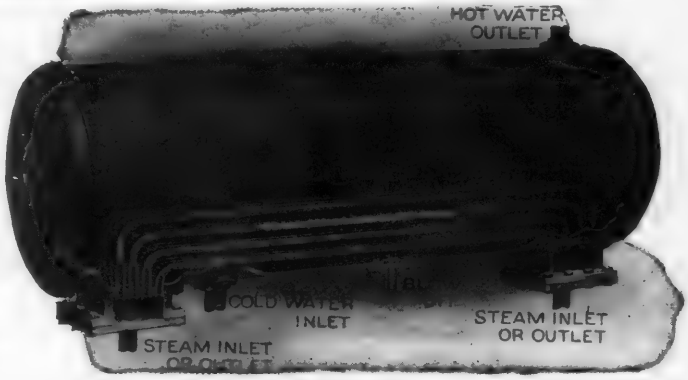

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WE ARE NOT TOO PROUD TO FIGHT

for our right to be considered makers of a practical efficient, satisfactory and serviceable steam radiator valve.

WE HAVE BEEN FIGHTING FOR SEVEN YEARS

with the sole idea of placing the best packless valve in the hands of engineers, plumbers and steamfitters.

WE CLAIM A VICTORY FOR THE LAVIGNE PRINCIPLE

as embodied in our Packless Quick-Opening Steam Radiator Valves, for the following reasons:

The valve has given universal satisfaction during the seven years of severe trials
It positively will not leak air, water or steam
It opens quickly and closes quickly
It is free from mechanical mistakes
It is not an experiment
It is a well finished, handsome, shapely valve

Ask your jobber for details.

LAVIGNE MANUFACTURING COMPANY
DETROIT, MICHIGAN

Be Prepared for the Fall Business

Sell Your Exhaust Steam for Heating

There's an ever-increasing demand for just this kind of public utility.

In progressive cities and towns in almost every state in the Union there are Electric Light and Power Companies that have installed the

AMERICAN DISTRICT STEAM HEATING SYSTEM

Business buildings, entire blocks, private residences and public institutions are availing themselves of this "money-saving" opportunity, and are being heated by live or exhaust steam delivered through underground mains from a central station.

Whatever size your plant—whether a large central station or a small lighting plant, you can dispose of your exhaust steam in this most profitable way.

The American District Steam Heating System is the best to install. Materials and plans are furnished and construction is superintended to the customers' meter.

Write today for our literature describing and illustrating this system.

AMERICAN DISTRICT STEAM COMPANY

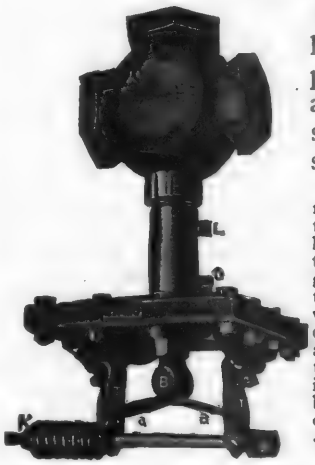
General Offices and Works: NORTH TONAWANDA, N. Y.

NEW YORK CHICAGO, ILL. SEATTLE, WASH.

For Safety, Sureness of Operation and Durability

FOSTER PRESSURE REGULATORS

FOR STEAM HEATING SERVICE



(Classes "Q" and "Q H") lead the way. Designed especially for steam heating, and suitable for vacuum systems, for delivery pressure of from 1 to 15 lbs.

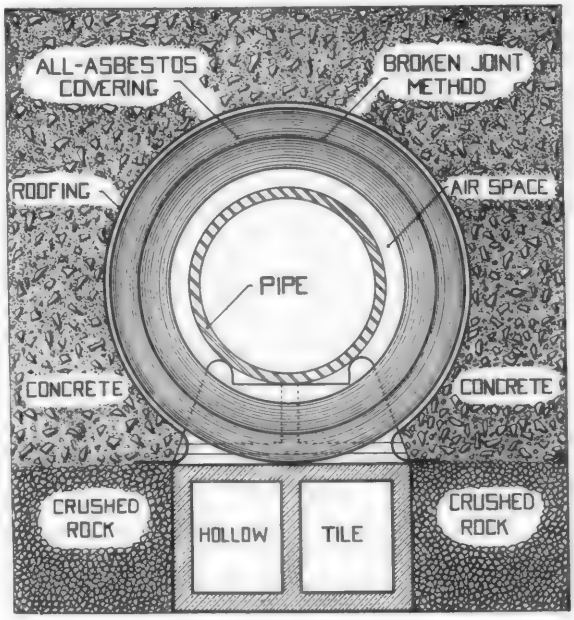
We make several types of pressure regulators—those shown in the illustrations here were designed particularly for steam heating service, and they are very sensitive, reliable, high grade in every particular and superior to other makes in construction and workmanship. There are no weights or close fitting pistons, and are easily adjusted to the desired pressure between 1 and 15 lbs. Made in sizes ¾ inch to 2 inches inclusive, composition body. Larger sizes are fitted with composition renewable seats.

Class "Q" Class "Q H"

These Valves are fully explained on Pages 29 to 33 of our General Catalogue, No. 20.

FOSTER ENGINEERING CO., Newark, N. J.

CHICAGO, ILL., 189 North Dearborn Street
PITTSBURGH, PA., 518 Park Building
PHILADELPHIA, PA., 601 Harrison Building
BOSTON, MASS., 161 Summer Street



A type of Heating Mains with few specials—easily installed—permanent

INDESTRUCTIBLE

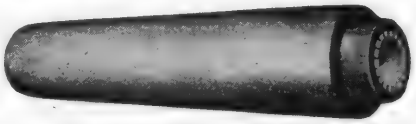
Conduit is made of CONCRETE and every LOCALITY "has the MAKIN'S"

Let me furnish you the covering, expansion joints, etc., together with complete specifications to meet your case.

Ask for quotations or estimates.

J. C. HORNUNG
ENGINEER
343 South Dearborn Street
Chicago

STANDARD
Steam Pipe Casing



For Insulating Underground Steam Pipe. Tin Lined, or Unlined.

Every salesman has his argument in order to sell the product he represents. Listen to our argument, be the judge, and you will find same not theoretical but practical, and from actual experience.

When you cover your steam line with our make of casing you have the assurance that the line will be constructed so that no heat will escape, and will be water tight as well, with ample space for air chamber.

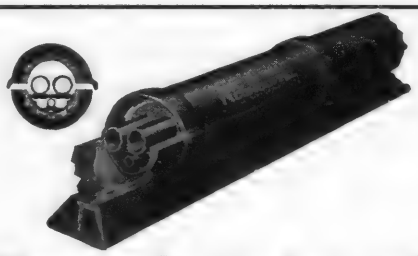
Should occasion arise that it is necessary to get at the steam pipe, our covering CAN BE TAKEN APART WITHOUT DESTROYING THE STAVES in the sections of casing, and the same casing can be used again. LET US EXPLAIN HOW.

If your line runs in different branches we will build the casing in exact lengths so that you will not have to cut any sections, which means no waste or extra expense to you.

Our method of building covering will be to your interest. Our product is right, attention prompt, and prices low.

SEND FOR BOOKLET

Standard Wood Pipe Co.
WILLIAMSPORT, PA.



Where only the best will do, use Ric-wiL.

Few items used in modern heating plants have had their superiority proved so conclusively as has the

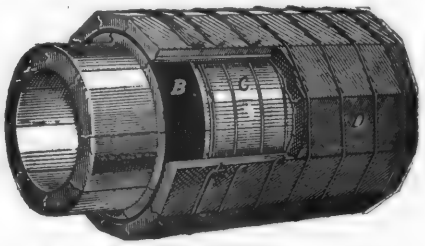
RIC-WIL METHOD

of insulating underground heating and hot water pipes.

The perfect underdrainage and substantial, continuous support for the conduit—the 90 per cent. perfect insulation—the economy of installation—and the great saving of fuel—these are things you will want to know all about—**and we have covered them all in the book "Ric-wiL Method."**

Send for this book—to-day.

THE RIC-WIL CO.
623 New England Bldg. Cleveland, Ohio



A—Inner Shell, 2 inches thick.
B—Asphaltum Packing.
C—Dead Air Space.
D—Outer Shell, 1 inch thick.

Cover Your Steam Pipes

WITH WYCKOFF'S IMPROVED

CYPRESS COVERING

Made of Gulf Cypress, the wood eternal

Not affected by wet and dry conditions common to steam-pipe trenches. Will not rot. Lasts twice as long as Pine Casing. Absolutely water and steam tight. Each shell is wound with heavy galvanized wire. Coated all over with the best known preservative—Hydrolene B.

Let us answer your questions and tell you all about it. Booklet on request.

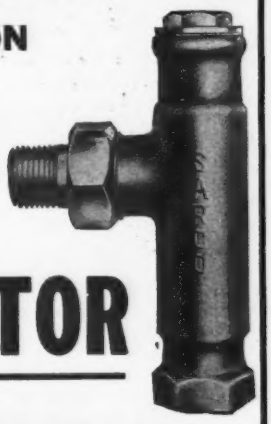
A. WYCKOFF & SON COMPANY

ELMIRA . . N. Y.

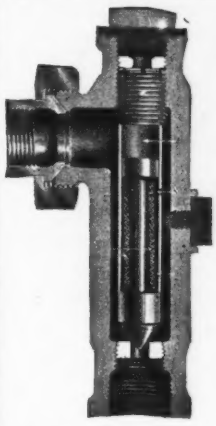
Chicago, Ill., 551 West 14th Place
Pittsburgh, Pa., Johnson-Peter Co.
Pittsburgh Terminal Warehouse

STOP! LOOK!

DO YOU KNOW THAT FOR COMPLETE AND LASTING SATISFACTION YOU SHOULD USE



RADIATOR TRAP



SARCO

WHY?

BECAUSE its construction is different than that of any other type of trap, and has proven that liquid expansion and contraction is the most reliable form of motive power for any thermostatic radiator trap.

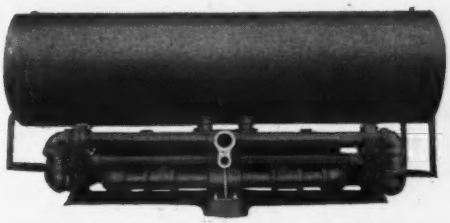
The Sarco has this liquid sealed in a chamber, the expansion operates on a spirally corrugated tube carrying the valve head. Steam coming in contact with this chamber of liquid immediately closes trap. Condensation opens it.

Send for detailed information and prices.

SARCO COMPANY, Inc.

Woolworth Building

Chicago New York Detroit



Side Showing Steam Inlet and Vent Outlet

The Farnsworth Duplex Boiler Feeder

feeds condensation direct from the heated apparatus into your boilers under high or low pressure, and conserves the heat units, which saves coal and eliminates pumps.

It also feeds condensation into high or low pressure boilers from vacuum heating systems, separates the air and eliminates the use of vacuum pumps; has two chambers, one is always open receiving the condensation while the other is under pressure feeding it into the boiler. It handles all the necessary make up water into boilers and absolutely eliminates boiler feed pumps, does better work, and requires 75% less steam in its operation. It needs no lubricating oils, is absolutely packless, has no trunnion stuffing boxes, weights, levers, or any operating parts inside of the tank. The operating valves are the only parts and are on the outside.

The whole apparatus is built heavy and rugged, is very dependable, and the control of the Everlasting Valves is very positive, as the alternate filling and emptying of the opposite chamber oscillates the tank and operates the control valves. For further particulars send for our catalogue.

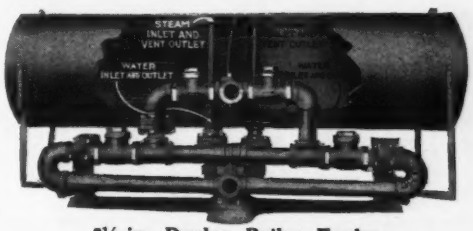
Farnsworth Mfg. Co.

Engineers

65 Beverly St., Boston, Mass.

New York Office and Show Room

72 TRINITY PLACE



2½-in. Duplex Boiler Feeder
Side Showing Water Inlet and Outlet

DAVIS

Davis Pressure Regulators Save Steam

When economy suggests or necessity demands the use of steam at less than boiler pressure use A DAVIS REDUCING VALVE.

This automatic device saves steam by delivering the exact amount required and no more. Being simple in construction and positive in action you may rely upon it for efficient service.

For forty years Davis Valves have been used by men of experience who demand the best possible results from their equipment.

G. M. DAVIS REGULATOR CO.
436 MILWAUKEE AVENUE CHICAGO
New York Boston Philadelphia Pittsburgh San Francisco

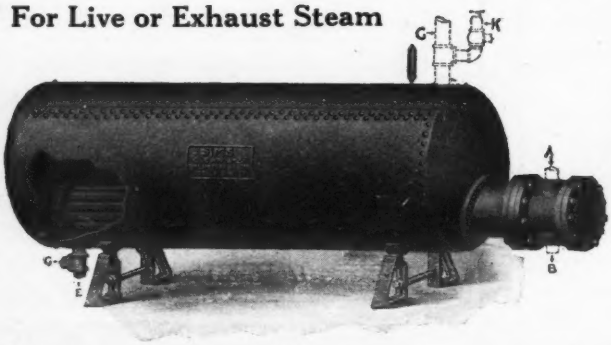
Send for Complete Catalog No. 8

VALVES

SIMS CLEAN E-Z STEAM TUBE HEATER

For Hotels, Apartment Buildings, Hospitals, Y. M. C. A. Buildings, Schools, etc.

For Live or Exhaust Steam

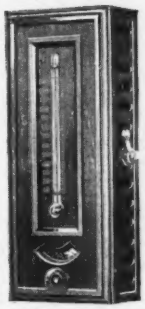


requiring large quantities of hot water. This type of heater should be used in preference to circulating generator and storage tank—or instantaneous heaters.

Special attention given to all kinds of water heating problems based on long experience in this work.

Valuable tables have been prepared, showing heater capacities using steam at various pressures. These tables are yours for the asking.

THE SIMS CO., 18th St., Erie, Pa.



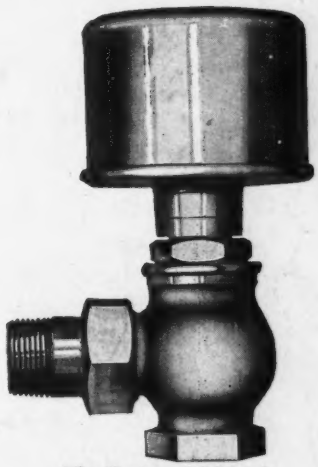
The Powers Thermostat Model D

Automatic Heat Regulation

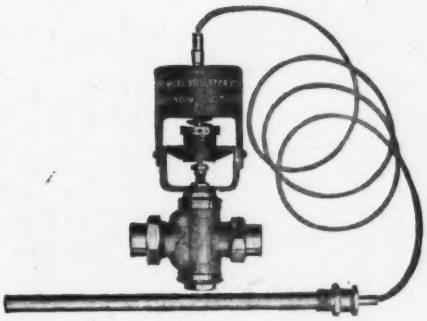
The Powers Systems

We claim for this apparatus greater beauty of design, greater efficiency, greater durability, and we give better service than can be secured elsewhere. For 25 years we have been building heat regulation as good as we know how, and thousands of pleased customers are a good indication of our success.

The Quality Justifies the Price



The Powers All Metal Diaphragm Radiator Valve



The Powers Hot Water Tank Regulator No. 11

In a class by itself because of its unequalled efficiency. We have other specialties well worthy of your attention and would like to put your name on our bulletin mailing list. A postal card will do it.

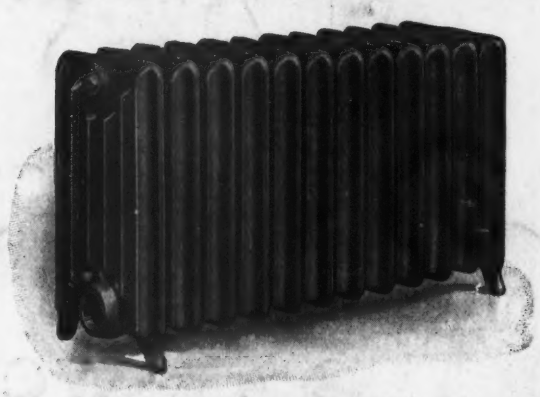
THE POWERS REGULATOR COMPANY

101 PARK AVENUE
NEW YORK

5 SO. WABASH AVENUE
CHICAGO

Owners quickly approve

If you would have owners pay promptly you should install heating outfits that give prompt and lasting satisfaction, as do outfits of



The Popular Rococo Window Radiator

AMERICAN RADIATORS & IDEAL BOILERS

The only motive an owner has for holding up payment disappears it a competent contractor has installed the heating materials that are most favorably known.

An S-25-7 Ideal Sectional Boiler

Thus the responsibility for the goods is taken off the contractor's shoulders and assumed by the owner—the contractor has only to stand sponsor for his workmanship

Begin NOW to make collections easier by establishing a regular practice of installing these well known materials on all your work.

AMERICAN RADIATOR COMPANY

Branches in most large cities